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XXXVI.

A WAX MODEL OF THE NASAL CAVITY AND PARANASAL SINUSES.

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The morphology and topography of the complicated system of paranasal sinuses are very inadequately shown by the usual anatomic methods of dissection, sections or skeletal preparations. Models of these structures are, therefore, highly desirable. Casts or corrosion preparations have been attempted with varying degrees of success by Rauber ('73), Braune and Clasen ('76), Siebenmann ('91), Brühl ('00), and others. The figure of the cast of the accessory nasal sinuses by Sieur and Jacob (Testut and Jacob, Figure 358) and the models of the sphenoidal sinuses made by Loeb ('12) bring out so vividly the size, shape and relations of these parts, that they sug-

gested the desirability of making a cast forming a model of the entire nasal cavity with the paranasal sinuses. The object of the endeavor was to reveal more clearly the complicated form and relationships of these important structures. The nasal pharynx, on account of its intimate relation to the nasal cavity, was also included in the model.

A well developed head was selected, the entire body having been hardened by intravascular injection of formalin. The subject was an adult male, age and previous history unknown. Life-size drawings were made of the frontal and lateral views of the head. A horizontal line (as an alignment mark) was drawn on the surface at the level of the zygoma, to aid later in assembling the sections. The head was then cut into frontal (coronal) sections, each about one centimeter in thickness. These sections were carefully cleaned and studied with special reference to the form, relations and communications of the various sinuses. By means of outlines traced through glass plates, drawings were made of each section. In these drawings the various cells were identified and their communications noted.

Each section was then placed upon a glass plate and a cast made of that portion of the nasal cavity, sinuses, etc., contained in it by pouring into them melted beeswax. A heated glass pipette was used for this purpose, and care was taken to see that the wax penetrated thoroughly into all the smaller cells. The alignment marks on the surfaces of both sides of each section were connected by lines scratched across the corresponding surfaces of the wax. These lines served later for orientation, when the wax slabs from each section were piled together and fused to form the whole model. Fine brass wires were also embedded in the wax wherever necessary to attach isolated cells and to preserve their proper relations, or to strengthen weak points. The tissue around the wax casts was then carefully removed, and the individual wax sections were superimposed, using the alignment marks previously mentioned. Additional wires were then embedded in the wax to unite the sections, and also wherever it seemed necessary to preserve relations or to strengthen the model. It was found that the wax had penetrated very well, and, though great care was necessary, no special difficulty was experienced in assem-

bling the sections. The junction lines between the wax plates were obliterated by a heated needle, and the surface of the model carefully smoothed.

The model was then mounted and given a coat of white paint. The photographs of the various views were then taken. Finally the model was finished by painting in various colors to represent the different parts. The nasal cavity remained white, the frontal sinuses and nasofrontal ducts were painted blue, the lacrimal sac and nasolacrimal ducts yellow, the maxillary sinuses brown, the anterior ethmoidal cells red, the middle ethmoidal (bullar) cells deep pink, the posterior ethmoidal cells light pink, the sphenoidal sinuses green, and the nasal pharynx grayish white.

The general orientation of the model is shown in Figures 1 and 2, representing the relations seen in the anterior and lateral views of the head as a whole.

The various parts shown in the model will now be considered briefly in order. To understand the relations, it must be kept constantly in mind that the model represents a cast of the cavities, or, in other words, the view which would be obtained if the parts surrounding the mucosa of the nasal cavity and sinuses were dissected away so as to reveal their external form and relations (as in Killian's dissections). The solid parts, such as the nasal septum and conchæ, are, therefore, merely negatively represented by spaces in the model.

I.—THE NASAL CAVITY AS A WHOLE.

The general form and relations of the nasal cavity as a whole are shown in a^{11} of the eight figures. The length of the nasal cavity from t^{1} ♀ nares to the choanæ, measures about eighty millimeters, or ninety-five millimeters to the posterior wall of the nasal pharynx. The maximum height is fifty-four millimeters, measured from the floor to the roof of the meatus nasi communis, or eighty-seven millimeters if measured to the upper part of the frontal sinuses. The maximum width, including the maxillary sinuses, is seventy-three millimeters. Of the nasal fossa proper, the width of the roof (meatus nasi communis) is two to three millimeters, of the floor (maximum, including the inferior meatus), about seventeen millimeters on each side.

The nasal septum (s), corresponding to the space between the two nasal fossæ, is shown in figures 5, 6, 7 and 8. It is asymmetric, with a marked convexity to the right, best shown in the superior view (figure 7).

The vestibules (v) are also asymmetric, the right bending lateralward at a marked angle, as shown in figures 5, 7 and 8. The right naris (N) is also displaced laterally and somewhat enlarged. These abnormalities may be due in part to a post-mortem artefact.

Although it does not appear clearly in the figures, the floor of the left nasal fossa, in the region of the maxillary sinus, extends about two millimeters lower than the floor of the right fossa. The maxillary sinus in its lowest part on each side is only about one millimeter below the floor of the corresponding nasal fossa.

II.—THE MEATUSES AND CONCHÆ.

In general the meatuses and conchæ are only partially visible in the models, being concealed by the various sinuses, especially by the maxillary sinus. A cast of the nasal cavity proper (without appendages) is shown in lateral view by Rauber-Kopsch (page 182, figure 229). This figure, showing the meatuses in their entire extent, is interesting for comparison with the present model. Figure 358 in the work of Testut and Jacob is likewise valuable for comparison, showing a lateral view of the accessory nasal sinuses. The colored plates of the dissections by Killian ('03) may also be mentioned in this connection.

The superior meatus is visible to a slight extent in the lateral and posterior views (figures 3, 4, 6, sm), just below the posterior ethmoidal cells, with which it is closely associated.

The middle meatus is visible to a slight extent at its posterior extremity, behind the maxillary sinus (figures 3, 4, 6, mm). Anterior to this the middle meatus proper is almost entirely concealed.

The infundibulum, however, forms a prominent ridge, visible above the middle portion of the maxillary sinus (figures 3, 4, i). Just above and behind the infundibulum is a depression corresponding to the bulla, especially well shown on the right side (figure 4, b). The communication between the

infundibulum and the maxillary sinus is also clearly shown on the model (figure 4, c). The relations of the infundibulum to the nasofrontal duct are mentioned later, in connection with the frontal sinus.

The inferior meatus is almost completely covered laterally by the maxillary sinus, excepting small portions at the anterior and posterior extremities of the meatus (figures 3, 4, 5, 6, im).

The nasolacrimal duct in lateral view is concealed for the most part by the anterior portion of the maxillary sinus (figures 3, 4, nd). On the right side it is visible throughout its entire extent in the anterior view (figure 5, nd). It opens inferiorly into the inferior meatus, about twelve millimeters from the anterior end of the meatus (twenty-eight millimeters behind the nares), and under cover of the maxillary sinus. Superiorly the nasolacrimal duct is continuous with the lacrimal sac (figures 3, 4, 5, ls). The total length of the duct and sac is about thirty-two millimeters. The portion above the maxillary sinus, which may be considered as belonging chiefly to the lacrimal sac, measures nineteen millimeters in length on the right side, and seventeen millimeters on the left side.

On the left side, the lacrimal sac and nasolacrimal duct present an interesting variation, the lumen being distended to a diameter of five by nine millimeters (flattened mediolaterally). On the right side the duct is nearly cylindrical in form, with a diameter of about three millimeters. (Even this diameter represents a moderate distention of the lumen.) No cause for the abnormal distention of the left duct and sac could be found in the original preparation. The aperture of communication with the inferior meatus was also dilated. The lumen was empty; the lining mucosa was smooth, and no traces of inflammation were visible. The lacrimal sac on each side is nearly uniform in caliber with the nasolacrimal duct of the corresponding side.

The conchæ are represented in the model by surface depressions between the corresponding meatuses, and, like them, are largely hidden by the maxillary sinuses. The anterior extremities of the inferior concha, and the posterior extremities of the anterior and middle conchæ, are visible in the various

views of the model (figures 3, 4, 5, 6, ic, mc). The superior concha is concealed by the posterior ethmoidal cells.

III.—THE MAXILLARY SINUSES.

The maxillary sinuses are prominent and relatively long anteroposteriorly (figures 3 to 8, ms). The measurements taken from the model, together with the averages (and range) obtained by Loeb ('09) on thirty sinuses, and by Schaeffer ('10) on ninety sinuses, are shown in the following table:

	Antero-posterior mm.	Supero-inferior mm.	Medio-lateral mm.
Right sinus on model	42	31	20
Left sinus on model	44	33	20
Schaeffer's average (and range)	34 (15-47)	33 (21-50)	23 (12-40)
Loeb's average (and range)	38 (17-42)	38 (17-47)	23.8 (8-33)

The relations of the maxillary sinuses to the meatuses, conchæ, and nasolacrimal duct, and the communication with the infundibulum (best shown in figures 4 and 7, c) have already been mentioned. As shown in the anterior view (figure 5), the lowest part of the floor of the maxillary sinus on each side is but very slightly (about one millimeter) below the level of the corresponding floor of the nasal fossa. Both sinus and nasal fossa extend about two millimeters lower on the left than on the right side, although the floors of the nasal fossæ reach the same level more posteriorly, toward the choanæ.

IV.—THE FRONTAL SINUSES.

The frontal sinuses (figures 3 to 7, fs) are below the average in size. The measurements taken from the model, together with the averages (and range) observed by Loeb ('09) in thirty sinuses (fifteen heads), are given in the following table:

	Supero-inferior mm.	Medio-lateral mm.	Antero-posterior mm.
Right sinus on model	29	25	10
Left sinus on model	33	24	13
Loeb's average (and range)	34 (14-51)	23 (7-42)	21 (9-33)

As seen in the front and rear views of the model (figures 5 and 6), the septum between the two sinuses is oblique. The

right sinus is somewhat smaller and more irregular in outline. The left sinus has a small rounded diverticulum, best shown in the lateral view (figure 3, d). In the superior view (figure 7, fs), the frontal sinuses appear blurred and enlarged, on account of nearness to the photographic lens.

The nasofrontal duct on each side passes nearly vertically downward from the frontal sinus to communicate with the anterosuperior extremity of the infundibulum. The nasofrontal duct on the left side is almost completely hidden by the anterior ethmoidal cells. On the right side it is partly visible (figures 5, 7, n). The developmental studies of Killian ('96), Schaeffer ('10), and Davis ('14), however, have shown that the nasofrontal duct rarely represents a direct continuation of the infundibulum as it is usually described in the textbooks of anatomy.

V.—THE ETHMOIDAL LABYRINTH.

The ethmoidal labyrinth presents on the model a mass of irregular cells, of varying size and shape. They are especially well seen in the lateral and superior views of the model (figures 3, 4 and 7), from which it is evident that the two sides are not symmetrical.

The measurements of the ethmoidal labyrinth on the model, together with the averages (and range) obtained by Loeb ('09) for thirty labyrinths (in fifteen heads) are given in the following table:

	Antero-posterior mm.	Supero-inferior mm.	Medio-lateral mm.
Right labyrinth on model	34	24	13
Left labyrinth on model	36	28	10
Loeb's average (and range)	35 (22-54)	31.6 (17-59)	16.3 (9-28)

Three groups of cells may be distinguished in the ethmoidal labyrinth: the anterior (designated in the figures by the letter a), the middle (m), and the posterior (p). The anterior and middle groups, which communicate with the middle meatus, are frequently classified together as the anterior group.

The anterior group of ethmoidal cells is painted red in the model. On the right side, four anterior cells (figures 4, 5, a1, a2, a3, a4) are visible. The upper three (a1, a2, a3) are placed anteriorly and laterally to the nasofrontal duct, with

which they appear to communicate. The lower cell (a4), which is rudimentary, is attached to the anterior portion of the right infundibulum, lateral to the region of communication between the infundibulum and the nasofrontal duct. On the left side, six anterior ethmoidal cells may be distinguished (figures 3, a1 to a6). As the bone had been fractured in this region, some difficulty was found in determining the exact communications of these cells. However, two cells (a1 and a2) are attached to the anterior aspect of the nasofrontal duct, while another (a3) is attached posteriorly at the junction of the frontal sinus and nasofrontal duct. Just behind these is another (a5) whose communication is uncertain, and lower still another (a6) attached to the infundibulum near its communication with the nasofrontal duct.

The middle or bullar group of ethmoidal cells is painted deep pink in the model. It includes those opening into the middle meatus upon or just above the bulla ethmoidalis. On the right side they are not very well developed, only two (figure 4, m1, m2) appearing just above the depression (b) corresponding to the bulla. On the left side there are three (figure 3, m1, m2, m3). The two lower (m2, m3) apparently correspond to the bulla, with the third (m1) placed just above them.

The posterior group of ethmoidal cells (figures 3, 4, 7) communicate with the superior meatus, and are placed anterior to the sphenoidal sinus of the corresponding side. On the right side there is a large posterior ethmoidal cell, with several diverticula forming more or less distinct secondary cells (figure 4, p1, p2, p3, p4, p5). Below these the superior meatus (sm) presents two indistinct small pouches, evidently representing rudimentary ethmoidal cells of the posterior group. On the left side there are three well developed cells in the posterior group (figure 3, p1, p2, p3). Below these the superior meatus (sm) presents a small outpouching, similar to the rudimentary cells mentioned on the right side.

VI.—THE SPHENOIDAL SINUSES.

The sphenoidal sinuses are visible in the lateral, posterior and superior views of the model (figures 3, 4, 6, 7, ss). They are relatively small (especially the left), as seen by the follow-

ing table, including the averages (and range) found by Loeb ('09) in thirty sinuses (in fifteen heads):

	Antero-posterior mm.	Supero-inferior mm.	Medio-lateral mm.
Right sphenoidal sinus on model	16	20	18
Left sphenoidal sinus on model	15	14	12
Loeb's averages (and range)	21.5 (2-42)	22.8 (4-38)	18.4 (2-35)

Anteriorly the sphenoidal sinuses on the model show the usual proximity to the posterior ethmoidal cells (figures 3, 4, 6, 7, ss) and communicate with the recessus sphenoethmoidalis (seen in figure 7, r). Medially they are separated by a septum, which is comparatively thick except at one point. Inferiorly the sphenoidal sinuses (especially when enlarged) frequently approach the roof of the nasal pharynx. In this case, however, they are widely separated from the pharynx, as seen in lateral and posterior views of the model (figures 3, 4, 6).

The form and size of the sphenoidal sinuses in the model may be compared with the excellent series of casts of the sphenoidal sinuses by Loeb ('12).

VII.—THE NASAL PHARYNX.

The nasal pharynx, on account of its intimate and important relations to the nasal cavity, was included in the model. It is visible in all the views of the model, and calls for but little description.

Anteriorly the nasal pharynx communicates with the nasal fossæ (meatus nasopharyngeus) through the choanæ (figures 3, 4, 6, 8, ch). Each choana measures about twenty millimeters in height by thirteen millimeters in width, which is somewhat smaller than the average size.

Laterally the nasal pharynx presents on the model near the floor and just behind the choana on each side a small prominence corresponding to the ostium pharyngeum of the auditory (eustachian) tube (figures 3, 4, 6, 7, 8, et). Posterior to this is a broad vertical groove, corresponding to the torus tubarius (figures 3, 4, 8, g). Still behind this groove is a vertical ridge, corresponding to the pharyngeal recess, or fossa of Rosenmueller (figures 3, 4, 6, 7, 8, pr). In the posterior view (figure 6) it is evident that in this case the pharyngeal

recesses are asymmetric, that on the left side being smaller and placed more inferiorly. (This and other peculiarities on the model were carefully checked up with the original preparation to insure accuracy.)

Inferiorly the nasal pharynx below the pharyngeal recesses becomes narrowed from side to side (figure 6), and especially anteroposteriorly (figures 3, 4), to form the pharyngeal isthmus (pi) which communicates with the oral pharynx.

It is the intention to have this model reproduced and placed on the market, so as to make it accessible to anatomists, rhinologists and others who may find it useful.

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TABLE OF ABBREVIATIONS USED IN THE FIGURES.

a1, a2, a3, a4, a5—Anterior ethmoidal cells.
b—Depression corresponding to bulla ethmoidalis.
c—Communication of maxillary sinus with infundibulum.
c—Choana.
d—Diverticulum of frontal sinus.
et—Ostium pharyngeum of auditory (eustachian) tube.
fs—Frontal sinus.
g—Groove representing the torus tubarius.
i—Infundibulum ethmoidale.
ic—Inferior nasal concha.
im—Inferior nasal meatus.
ls—Lacrimal sac.
m1, m2, m3—Middle ethmoidal cells.
mc—Middle nasal concha.
mm—Middle nasal meatus.
ms—Maxillary sinus.
n—Nasofrontal duct.
N—Naris.
nc—Meatus nasi communis.
nd—Nasolacrimal duct.
nf—Nasal fossa.
np—Nasal pharynx.
p1, p2, p3, p4, p5—Posterior ethmoidal cells.
pi—Pharyngeal isthmus.
pr—Pharyngeal recess.
r—Recessus sphenoethmoidalis.
s—Nasal septum.
sm—Superior nasal meatus.
ss—Sphenoidal sinus.
v—Vestibule.

LEGENDS AND DESCRIPTION OF FIGURES.

FIGURE 1.

Anterior view of the head, to show the general orientation of the model and the surface relations. (X 2/3.)

FIGURE 2.

Lateral view of the head, to show the general orientation of the model and the surface relations. (X 2/3.) For explanation of the parts visible in the model, see Figure 3.

FIGURE 3.

Left lateral view of the model (X 4/5). The nasal fossa (nf) is seen extending upward and backward from the vestibule (v), though largely hidden by the maxillary sinus (ms). Only the anterior and posterior extremities of the inferior meatus (im) and the depression corresponding to the inferior concha (ic) are visible. Above the maxillary sinus may be seen the projection corresponding to the infundibulum (i). Behind the maxillary sinus may be seen the posterior extremities of the middle meatus (mm), the middle concha (mc), and the superior meatus (sm).

Behind the middle and inferior meatuses the nasal cavity is continuous, through the choana (ch) with the nasal portion of the pharynx (np). On the lateral wall of the nasal pharynx a short projection (et) corresponds to the pharyngeal orifice of the auditory (eustachian) tube. Behind this a broad vertical groove (g), corresponding to the torus tubaris, separates the tubal orifice from a thin vertical ridge (pr), representing the pharyngeal recess, or fossa of Rosenmueller. Below this the pharynx is compressed anteroposteriorly in the region of the pharyngeal isthmus (pi).

Above and behind the superior meatus is visible the left sphenoidal sinus (ss). Anterior to this is visible the ethmoidal labyrinth, the cells forming the three groups: posterior (p1, p2, p3), middle (m1, m2, m3), and anterior (a1, a2, a3, a4, a5, a6).

Above the anterior ethmoidal cell group extends the frontal sinus (fs), with a small, cell-like lateral diverticulum (d). The nasofrontal duct is hidden by the anterior ethmoidal cells.

The nasolacrimal duct (nd), in this case abnormally dilated, is seen anterior to the middle meatus, its lower portion being covered by the maxillary sinus. Its continuation upward corresponds to the lacrimal sac (ls), its fundus lying just anterior to the most anterior ethmoidal cell (a2).

FIGURE 4.

Right lateral view of the model (X 4/5). The general relations are similar to those described in Figure 3, with a few exceptions. Of the ethmoidal cells, there are five visible in the posterior group (p1, p2, p3, p4, p5), two in the middle or bullar group (m1, m2), and four in the anterior group (a1, a2, a3, a4). The nasofrontal duct (n) is partly visible behind the anterior ethmoidal cells, where it communicates with the infundibulum (i). Above and behind the infundibulum is the depression corresponding to the bulla (b). The nasolacrimal duct (nd) and lacrimal sac (ls) are not dilated, as on the left side. The communication of the maxillary sinus with the infundibulum is shown at c.

FIGURE 5.

Anterior view of the model (X 4/5). The anterior aspect of the nasal cavity is seen in this view. The interval (s) between the two nasal fossæ (nf) represents the nasal septum which, in this case, shows a marked deviation, with convexity to the right (better shown in the superior view). The vestibule (v) of the right side flares outward. The nares appear at N. On the inferolateral aspect of each nasal fossa is seen the anterior extremity of the inferior meatus (im), lateral to which is the maxillary sinus (ms).

Above the inferior meatus is seen the space corresponding to the inferior concha (ic). Between the inferior concha and the maxillary sinus, on each side, lies the lower portion of the nasolacrimal duct (visible in the figure only on the right side of the model). It unites below with the inferior meatus and extends upward to form the lacrimal sac (ls). Some of the anterior ethmoidal cells (a1, a2, a3, a4) are visible, and above these extends the frontal sinus (fs).

FIGURE 6.

Posterior view of the model (X 4/5). The broad expansion of the nasal pharynx (np) terminates inferiorly at the pharyngeal isthmus (pi). Laterally the extensions formed by the pharyngeal recess (pr), or fossa of Rosenmueller, are visible on each side. Anterior to these the ostium pharyngeum of the auditory (eustachian) tube is visible on the left side only (et). Anteriorly, the nasal pharynx communicates with the nasal fossæ (nf) through the choanæ (ch) on each side of the posterior border of the nasal septum (s). Lateral to the nasal fossæ may be seen the posterior aspects of the superior meatus (sm), superior concha (sc), and middle meatus (mm). The inferior concha and meatus do not appear clearly in the photograph. Lateral to the nasal cavity on each side is the maxillary sinus (ms). More superiorly appear the sphenoidal sinuses (ss), in this case rather small (especially the left) and widely separated. The ethmoidal labyrinth is indistinctly visible. The frontal sinuses (fs) are prominent above, with the beginning of the nasofrontal duct (n) on the right.

FIGURE 7.

Superior view of the model (X 4/5). The deflection of the septum (s), convex to the right, is somewhat exaggerated in this view, which is from above and slightly to the left. This also makes the left nasal fossa (nf) appear wider. The asymmetry of the vestibules (v) is apparent. The left maxillary sinus (ms) appears more prominent, due to the oblique view. Its communication with the middle meatus (at c) is visible on the right side, but concealed by the frontal sinus (fs) on the left. On account of being nearer the photographic lens, the frontal sinuses are out of focus and appear blurred and exaggerated in size. The right nasofrontal duct begins at the point n. The fundus of the distended lacrimal sac (ls) is visible on the left side.

Behind the frontal sinuses the narrow meatus nasi communis (nc) appears on each side of the nasal septum (s). At the posterior extremity of the meatus communis the recessus sphenoethmoidalis (r) is visible. A little of the left middle meatus (mm) is visible. A few of the anterior (a2, a4), middle (m2) and posterior ethmoidal cells (p1, p2, p3) are seen, forming the ethmoidal labyrinth. Behind thees are the sphenoidal cells (ss), the left much smaller, with a rather wide space separating them. Still more posteriorly appears the nasal pharynx (np) with the pharyngeal recesses (pr). The ostium pharyngeum of the auditory (eustachian) tube (et) is visible on the left side only.

FIGURE 8.

Inferior view of the whole (X 4/5). The inferior view is comparatively simple, made up chiefly of the floor of the inferior meatus of the nasal fossæ (nf) on each side of the nasal septum (s). Anteriorly are the vestibules (v) and nares (N). Posteriorly is the communication through the choanæ (ch) with the nasal pharynx (np). This presents the pharyngeal ostia of the auditory (eustachian) tube (et). Behind these on each side is a groove (g), corresponding to the torus tubarius, next to which is a lateral extension (pr) on each side, corresponding to the pharyngeal recess (fossa of Rosenmueller). The posterior extremity of the model corresponds to the pharyngeal isthmus (pi). Lateral to the nasal cavity on each side appears the floor of the maxillary sinus (ms).

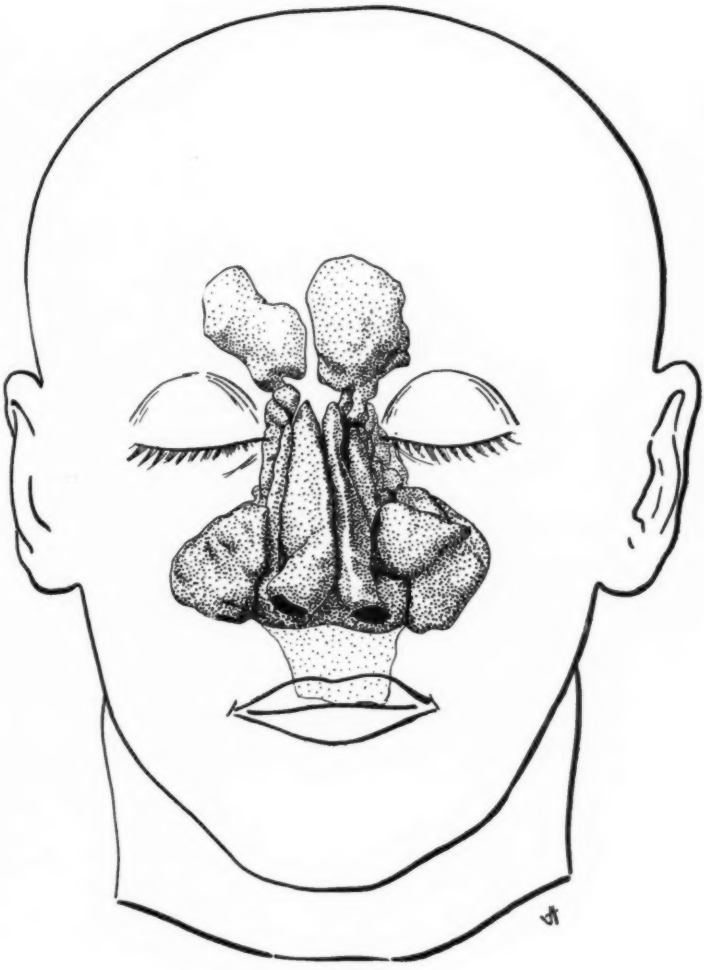

FIGURE 1.

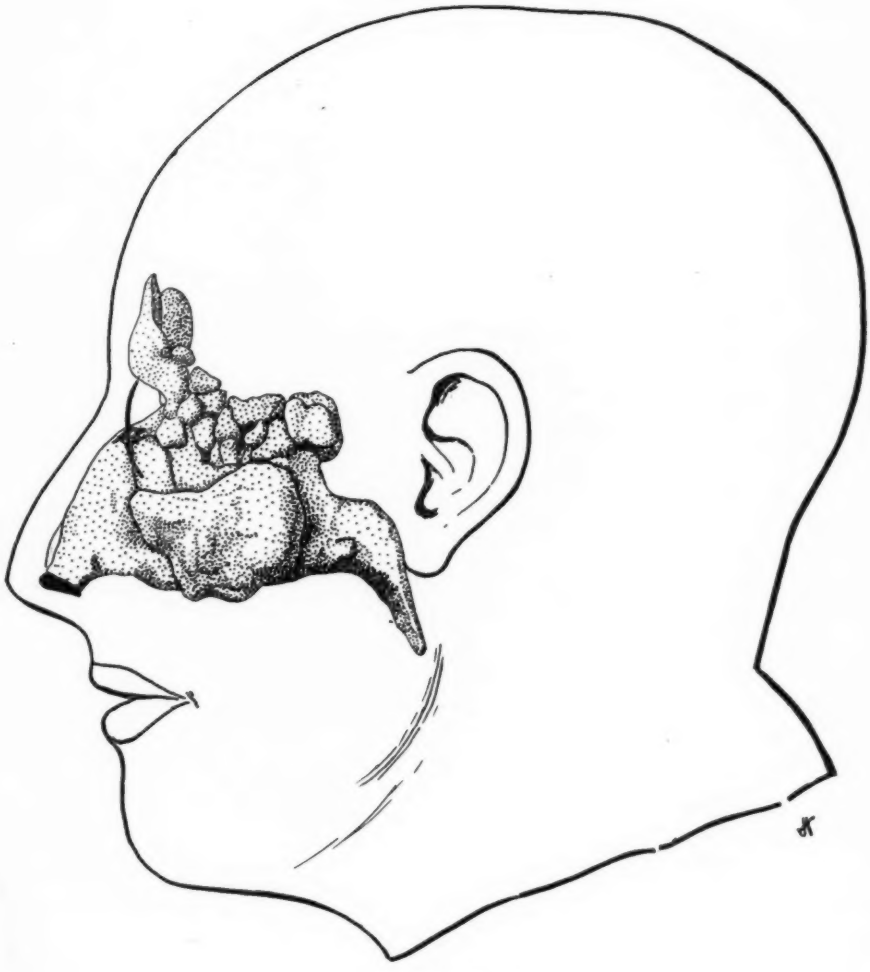

FIGURE 2.

FIGURE 3.

FIGURE 4.

FIGURE 5.

FIGURE 6.

FIGURE 7.

FIGURE 8.

XXXVII.

CLOSURE OF OBSTINATE OPENINGS OF THE DRUMHEAD.

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A few times in my life I have been confronted with an incorrigible drumhead opening. The literature on the subject is not helpful nor extensive, and yet these cases are sometimes of very great importance. They may involve hearing and chronic discharge or litigation, or all three, to say nothing of impaired reputation. I would suggest, therefore, that anyone having an experience of a helpful nature in such cases should place it upon record that others may be benefited. Acting upon this suggestion, I beg to report the following case:

Mrs. M. E., an old friend and patient (I mention the fact that she is an old friend, because I am quite confident that had not this been the case she would have wandered into other hands, and I should not have blamed her if she had) consulted me on January 15, 1917, with an abscess of the left middle ear that had not yet broken through the tympanic membrane. She was suffering much pain, and I made the usual horseshoe incision through the drumhead. Her suffering ceased and the discharge soon dried up. She was left, however, with a good-sized opening in the lower portion of the drumhead. Her tympanic cavity was free from discharge. Her hearing was very poor, and this was all the more regrettable because she had been almost completely deaf in her other, or right ear, for many years. She was thus dependent on her hearing in the left ear. Every effort was made to close this up. I used nitrate of silver in varying strengths. Insufflations of powdered boracic acid were tried. I scarified the edges of the opening. I used various kinds of artificial

ear drums for protection, such as cotton cones, Blake's taper discs over the opening, the discs being previously lightly dipped in alcohol. I used tincture of iodin and various other remedies, but all to no avail. About May 1, 1917, I read an article in *Laryngoscope*, by Dr. A. L. Dunlap of Shanghai, China, on the Okuneff trichloracetic acid method of treating this character of cases. I immediately put it into practice, and having previously applied a ten per cent solution of cocain to the parts, applied with a small cotton probe tightly wrapped with very little cotton, a small amount of the trichloracetic acid, limiting this application, as far as possible, to the edges of the perforation. It is not possible to confine the application exclusively to the edges of the perforation, but an effort should be made to do this as nearly as possible. The opening was then protected by a small cone of tightly twisted cotton. The opening soon diminished in size. Three applications were made at intervals of about a week. After the last application a scab formed over the opening, which was removed after a few days, and the patient was dismissed as cured with perfect hearing, May 25, 1917.

XXXVIII.

REPORT OF A CASE OF COEXISTENT CARCINOMA, TUBERCULOSIS, AND SYPHILIS OF THE ESOPHAGUS.

By L. W. Dean, M. D., and J. B. Gregg, M. D.,

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The purpose of this article shall be to briefly discuss carcinoma, tuberculosis, and syphilis of the esophagus; their coexistence in this organ, with the report of a very unusual case.

TUBERCULOSIS OF THE ESOPHAGUS.

The first case of esophageal tuberculosis was recorded by Denonvilliers,[1] 1837, and six years later Louis reported finding six cases of esophageal ulceration, presumably tuberculous, in one hundred and twenty tuberculous cadavers.

In the seventy-four years which followed this first observation, one hundred and three cases were reported; only sixty-nine of which can, with reasonable certainty, be classed as tuberculous. Since then numerous cases have been reported, until now the affection is no longer regarded as being of great rarity.

This disease has, however, received such slight consideration in medical literature that the physician does not take it into consideration in an otherwise tuberculous patient, and may ascribe the esophageal symptoms to a visible laryngeal tuberculosis.

The classification according to etiology, as suggested by Flexner,[2] is as follows:

1. Instances in which the tuberculous process arises through continuity or contiguity of structure; as in ulceration of the esophagus from a caseous bronchial gland, caries of the vertebræ, or from a tuberculous ulcer of the pharynx which passes down and invades the esophagus.

2. Cases in which there exists in the esophageal mucosa a previous lesion to be regarded as predisposing to tuberculous infection.

3. Instances in which (a) the esophagus is affected in the course of a general disseminated miliary tuberculosis; and (b) in which there is infection of the mucosa from tuberculous sputum where no previous lesion existed.

Of the nineteen cases of undoubted tuberculosis collected by Flexner, but two cases belonged to Class 2, in which we are especially interested in this report.

When seen as an extension from the larynx, especially as "party wall" lesions, the esophageal lesions present much the same picture as the laryngeal disease.[3] When, however, they are not confluent with a lesion in the pharynx or larynx in the esophagus, the endoscopic appearances are those of superficial ulceration, or a simple erosion, and there may be yellowish or whitish granules in the neighborhood of the erosions or ulceration. Cicatrices have been observed by Jackson but twice: once in connection with ulceration, and once in invasion of the esophagus by peribronchial tuberculous glandular processes. The ulcerations of esophageal tuberculosis usually are more superficial and less inflammatory in character than either cancer or lues. The diagnosis here, as elsewhere, rests upon the microscopic findings in pieces of involved tissue removed by means of the esophagoscope.

SYPHILIS OF THE ESOPHAGUS.

Syphilis involving the esophagus, although rare, has long been known to exist, having been described by Marcus Aurelio Severino (1580-1656).[4] Prior to the days of esophagoscopy,[5] the few diagnoses of lues of the esophagus were made solely from the disappearance of esophageal symptoms following antiluetic treatment. Such diagnoses necessarily are apt to err.[6]

The esophagoscope has shown that syphilis of the esophagus may present itself as the mucous plaque, a gumma, an ulcer, or as a cicatrix. For diagnosis, the esophagoscopic appearance must be considered in relation to the history, the concomitant lesions, the therapeutic test, the Wassermann reaction, the examination of the tissue, and the search for spirochetes.

The esophagoscopic appearance of the luetic ulcer is largely due to mixed infection, with resultant inflammatory condition. The mucous plaque appears similar to that seen in the fauces. It may be slightly elevated in one part, with simply a bluish white cloudiness in another part. The lesion is typically inflammatory in character. The cicatrix of luetic esophagitis does not differ from other cicatrices.[7]

CARCINOMA OF THE ESOPHAGUS.

Carcinoma is the most important neoplasm and the most common disease affecting the esophagus.

Eighty per cent of malignant esophageal cases are carcinomatous.[8]

In 5079 autopsies, Zenker[9] found carcinoma of the esophagus primary in only thirteen cases, and secondary in but six. Williams[10] has found them to constitute 5.3 per cent of all carcinomatous tumors, and to be much more frequent in men than in women. Von Hacker[11] states that over seventy-two per cent occur in males, and that the neoplasm is usually primary in the esophagus. They may develop by extension or by implantation,[12] but do not occur in this locality as the result of metastasis.[13]

Carcinoma of neighboring organs may spread to the esophagus and be inoculated from a cancer situated higher up or lower down, and the entire tube may become covered with carcinomatous nodules. The cancer is usually an epithelioma (pavement epithelium); glandular cancer and the colloid form are more rare. As a rule, only a portion of the esophagus is attacked, with the production of insular infiltration forming a segment on one side of the tube, or annular, cauliflower-like and papillomatous tumors.

Carcinoma of the esophagus is found most frequently in one of three localities: at the cardiac orifice, opposite the bifurcation of the trachea, or on a level with the cricoid cartilage.

Jackson gives the following forms of esophageal carcinoma:

1. Submucosal infiltration covered by perfectly normal membrane; usually associated with more or less bulging of the esophageal wall, and usually associated with hardness and infiltration.

2. Leucoplakia.

3. Ulceration projecting but little above the surface at the edges.

4. Rounded nodular masses grouped in mulberry-like form, either dark or light in color.

5. Polypoid masses.

6. Cauliflower fungations.

It is always well to remember that a carcinomatous lesion which has existed for some time may have engrafted upon it a mixed infection, with resutling inflammation.

The real diagnosis rests on the histologic examination of a specimen removed esophagoscopically. Submucous tumors should not have a piece removed for diagnosis because of the danger of causing ulceration and rapidly increasing the growth of the tumor if it be malignant.

Seventy per cent of the cases of esophageal carcinoma have been found in patients above fifty years, but it has also been observed in young individuals (nineteen years of age).

Irritation, mechanical, chemical or thermal, is a most important predisposing factor in the etiology.[14]

Zenker believes that alcohol is a very common irritant to the esophageal mucosa, and may predispose to carcinoma.

Körner[15] and Voelker attribute most esophageal carcinomata to the irritation produced by the passage of large boluses of poorly masticated food, and this has been in accordance with the apparent etiology of the cases with which we have dealt.

It is doubtful if any antagonism exists between carcinoma and tuberculosis; there is also no special favoritism; yet cancer is more frequent among those with latent tuberculosis than among those at the cancer period of life.[16]

The coexistence of tuberculous disease and cancer in the same part has been shown by Crawford, in the mammæ; Franque, in the uterus; Frerichs, in the liver; Beale,[17] in the larynx; Dalton, in the large intestine; Naeghi, in the rectum, ilium and cæcum; Dixon,[18] in the intestine; and by Lapeyre,[19] in the hand.

Certain observers have held that the tubercle bacillus and its toxins are concerned in the etiology of cancer, but Dixon, Smith and Fox,[20] after animal experimentation, convinced themselves that the tubercle bacillus and its products could

stimulate epithelial structures to hyperplasia, but not produce an invasive tumor. To explain the combination of the two diseases two theories have been suggested:[21]

First, that the chronic inflammatory action of tuberculosis prepared the way for the development of cancer.

Second, that cancer, by lowering the general nutrition, assisted the growth of tuberculosis.

Cases of coincident carcinoma and tuberculosis of the esophagus have been reported.[22]

Zenker[23] reports a case of stricture of the tube produced by a girdle ulcer of rodent character, which on examination microscopically proved to have the typical appearances of a squamous epithelioma. The growth invaded the deeper strata of the mucosa, and at times penetrated the muscularis. In the border of the cancerous portion, near the normal tissue, typical tubercles existed, some of which were caseous. The neighboring lymph glands were also involved in the cancerous and tuberculous conditions. Tubercle bacilli were found in small numbers in the tubercles. Zenker favors the view that the carcinomatous lesion was primary, the intact epithelium being resultant to tuberculous infection.

Cordna[24] reports the case of a man of sixty years, who came to autopsy with the clinical diagnosis of carcinoma of the esophagus, incipient pulmonary tuberculosis, and adhesive pleuritis. In the esophagus, at about the bifurcation of the trachea, was found an ulcer ten to fifteen centimeters long, which affected the whole circumference. The edges of the ulcer were somewhat elevated and firm, the base was soft and pulpy. Upon sectioning the ulcer, the entire wall of the esophagus was found almost destroyed, forming a small tumor mass. Microscopically, both a carcinomatous and a tuberculous lesion was found. Tubercles in the process of caseation were found in the middle of the cancerous ulcer and about its periphery. No tubercle bacilli were found after careful search.

Cordna thought the tuberculous invasion of the cancerous ulcer took place through the lymphatics leading from tuberculous areas in the lungs. It would seem, however, more probable that the secondary tuberculous involvement was due to sputum deglutition.

Pepper and Edsall[25] [26] report the case of a man, forty-two

years of age, who had tuberculosis of the lungs, larynx, cervical glands, and esophagus. The esophagus was patulous and normal as high up as the level of the arch of the aorta. Above this point and to the junction with the pharynx, the lumen had entirely disappeared.

The esophageal walls and surrounding tissues had formed a band of dense fibrous tissue about 1.25 centimeters thick and 3.75 centimeters broad, which was firmly bound to the vertebræ. Examined microscopically, cancerous tissue was found on a dense fibrous tissue basis; a tubercle-like mass undergoing fibroid changes, with an occasional giant cell, and tubercle bacilli.

The central and deeper portions of the tumor were composed mainly of fibrous tissue; this leading the authors to conclude that tuberculosis was the original cause of the disease, while cancer subsequently infiltrated the occlusion.

Weyeneth[27] reports the case of a man of fifty-eight years, who had pulmonary tuberculosis for five years, for four years suppuration and deafness of the left ear; and later involvement of the right ear. At the time of examination there had recently developed difficult deglutition and vomiting after eating. A sound was passed into the stomach without meeting an obstruction. After three weeks death occurred, the cause being given as "tuberculosis pulmonum et intestini." The autopsy showed tuberculosis of both lungs and several ulcers in the neighborhood of the ileocecal valve. On the anterior wall of the esophagus, and on a level with the bifurcation of the trachea, was an oval ulcer that macroscopically gave the impression of an ulcerated tumor. Surrounding the ulcer was an area over which the mucosa was destroyed. Scattered throughout this denuded area were numerous small nodules, both isolated and grouped. Granulation tissue covered the base of the ulcer, and the esophageal wall in the neighborhood of the ulcer was thickened. Microscopically the chief mass was found to be composed of cancer tissue with recent tuberculosis, tubercle bacilli being found in the nodules about the periphery.

In this case the sequence was: tuberculosis of the lungs and intestines; carcinoma of the esophagus; tuberculosis of the esophagus. Weyeneth's opinion, concurred in by Professor Ribbert, was that the malignant growth antedated by several

months the tuberculous invasion. Infection by the sputum[28] seems probable, as there were no foci in the neighboring lymph glands.

Syphilis in combination with carcinoma or with tuberculosis is more rare.

Kellert[29] has found relatively few cancer patients who gave a specific history, and Wassermann tests on their blood serum seldom gave a positive reaction.

Occasionally[8] leucoplakia has been observed in the esophagus, similar to that of other mucous membranes, coincident with carcinoma of the esophagus. As carcinoma develops in other situations where there is leucoplakia, it is possible that here also it may occur in some cases of syphilis as the causal agent for the leucoplakia.

According to Lexer Bevan,[30] carcinomas of the mucous membranes may develop from fibroepithelial growths and from ulcers of all kinds, especially the tuberculous and syphilitic.

Dennis[31] has notes on a case in which a diagnosis of tuberculous laryngitis was made in a woman with a history of pulmonary and hip joint tuberculosis. Later a characteristic skin syphilid was discovered, and under antiluetic treatment the larynx rapidly healed, except in a comparatively small area, which remained obstinate. He considered that this was probably a case of syphilis of the larynx on which a tuberculous infection was grafted.

According to Dennis,[31] Moritz Schmidt has reported a case in which tuberculosis, syphilis and carcinoma were all present in the larynx of the same patient.

Other writers[32] [33] report laryngeal cancer having coexisted with laryngeal syphilis and with laryngeal tuberculosis.

Jackson[34] reported a case before this society, in which he was certain that carcinoma, syphilis and tuberculosis coexisted in the larynx. The patient, a man of fifty-two years, had a family history of tuberculosis, a history of a primary luetic lesion three years before, followed by well marked secondaries, and at first examination a gumma of the septum. The larynx was in the ulcerative stage, the respiratory chink being narrowed to an oblique slot. Fungating masses protruded from the ulcers, but not sufficiently to completely occlude the laryngeal lumen. The neck was full of enlarged hard lymphatic

glands. Jackson considered the diagnosis of laryngeal syphilis with perichondritis indisputable, and the patient was put on vigorous mixed treatment, with marked laryngeal improvement. Healing occurred until the only lesion was a fungous, warty-looking mass on the left cord and filling the left ventricle. Here all improvement ceased, and overwhelming doses of potassium iodid, with mercury to full tolerance, for two months, had no effect on the growth, which began slowly to increase in size. Repeated examinations of the sputum revealed tubercle bacilli. A specimen of the larynx was removed and proven to be an epithelioma.

Kellert[20] reports the case of a woman whose postmortem examination led to the following anatomic diagnosis:

Carcinoma of the pharynx with metastases to the cervical lymph node; tuberculosis involving the same area of the pharynx; tuberculosis of the same lymph nodes as involved by the carcinoma; pulmonary tuberculosis with cavity formation; tuberculous pleuritis with effusions; tuberculous ulcers of the small intestine; and tabes dorsalis, syphilitic.

Moritz Schmidt[35] has observed a case with Roth, which was diagnosed tuberculosis of the larynx. There was healing of this lesion, yet in spite of the fact that the patient denied syphilis, tertiary lesions were found in the larynx. There was also partial healing of this second lesion, but a growth diagnosed microscopically by Weigirt as carcinoma, appeared upon this site, and from which the patient finally died.

Case.—Mr. J. S., white, male, sixty years of age, German, a tailor. Referred by Doctor F. W. Bailey of Cedar Rapids, Iowa.

The patient entered the University Hospital, April 17, 1916, complaining of inability to swallow well, weakness and cough.

Present Illness.—Twenty-eight years ago he first had trouble in swallowing, lasting for five weeks. His only trouble at that time was dysphagia; no loss of weight, no cough, no regurgitation or lodging of food. This attack began suddenly and ended suddenly without treatment of any kind. Since that time up to November, 1915, he had no trouble of any kind.

In November, 1915, while eating supper, he swallowed a

piece of meat not well masticated, which seemed to lodge just back of the sternum, causing violent coughing. The coughing spell soon ended and the feeling as of something lodged in the throat disappeared. He drank some liquids at once without difficulty, and the next morning he ate as usual.

For about six weeks he swallowed as well as ever, but about the last of December, 1915, he noticed that he was becoming poor. About January 1, 1916, he began again to have some trouble in swallowing, the amount of dysphagia varying considerably. Gradually the swallowing became more difficult, so that articles of solid food were not eaten. Even in swallowing soft food he would often choke and cough so violently that food was expelled through both the nose and the mouth. He coughed a good deal, but not at any particular time; no event seemed to bring on these attacks. No blood was ever coughed up; only a very tenacious slimy sputum, like the white of an egg, only more sticky. He does not regurgitate food eaten hours before. The throat feels dry, and he has marked thirst, which, owing to the difficulty in swallowing, he cannot satisfy.

At the present time he is unable to swallow anything with surety. He has lost fifty pounds in weight, and is markedly weakened, sallow and anemic. He complains of pain in the chest just behind the sternum, which is severe enough to awaken him at night. During these attacks of pain he finds it difficult to breathe.

Family History.—His father and mother are dead, the cause of death being unknown. He has five half brothers alive and well; one half sister alive and well.

He has four children alive and well. His wife has had three miscarriages, and one stillbirth.

Past History.—He had measles as a child, but no other childhood diseases; no fevers with the exception of malaria.

He uses beer and whisky moderately, never to excess. He chews tobacco moderately. He denies venereal history, but in 1887 he had a swelling of the cervical glands and a very sore throat. No other glands became enlarged, and there was no skin eruption. He denies sweats and hemoptysis; has had some cough, but not excessive. He is susceptible to cold, but there has never been any dyspnea.

He was hit on the head at one time, resulting in a skull fracture which caused the left ear to become deaf.

General examination by Doctor C. P. Howard, May 5, 1916. The patient is a poorly nourished and developed man of stated age, and gives the appearance of having lost much weight. The temporal arteries stand out prominently.

The muscles are small, and there is a marked myoidema. The skin is hot, moist and covered with acne, without scars or areas of pigmentation suggesting a previous lues.

The thorax is of the senile emphysematous type, with high clavicles and rounded back. Expansion is fairly restricted equally. Litten is present on both sides. The percussion note is definitely impaired in the right supraspinous fossa and over the right clavicle. No changes in vocal fremitus. The breath sounds are feeble and vesicular, nowhere prolonged. Definite fine crepitations are heard over the apex, spine, clavicle and scapula on the right side, an occasional crepitation being heard over the left scapula.

Heart.—The point of maximal intensity is in the fifth interspace eight centimeters from the midsternal line. The area of relative cardiac dullness extends four centimeters to the right of the midsternal line and seven and one-half centimeters to the left. The heart sounds are distant; no murmurs; a_2 is not definitely accentuated.

The radial pulse is synchronous and equal; of good volume.

The blood pressure is: systolic, 118 millimeters Hg.; diastolic, 60 millimeters Hg.

There is no tracheal tug and no retrosternal dullness.

The abdomen is flat and doughy; no masses or areas of dullness. The liver or spleen cannot be felt.

The shins are free from edema. There are two or three nodes over the right shin; possibly traumatic. The reflexes are normal on each side.

Diagnosis.—Tuberculous involvement of both apices.

ROUTINE EXAMINATION.

Eyes.—Chronic catarrhal conjunctivitis is present, with some lacrimation; tear ducts patent. The pupils are round, equal, two millimeters in diameter, reacting to light and accommodation. Rotations are normal. The media are clear; the fundi showing no evident lesion.

Right eye, vision equals 6/60. Left eye, vision equals 6/60.

Ears.—Right. The canal is clean; drum retracted slightly, but the ossicles move with Siegel's otoscope. High notes are well heard, but low notes are slightly cut down. He hears A, C^3 and C^4 tuning forks; not the A fork. Weber localized to the right.

Left. The canal is clean, drum retracted, the ossicles not moving with Siegel's otoscope. Galton whistle and none of the tuning forks are heard by air.

Hearing with alarm.—Right, whispered voice, twelve feet; spoken voice, forty-five feet. Left, whispered voice, 0; spoken voice, 0.

Nose.—The septum is deflected to the right, with a large spur on the left. Each middle turbinate is enlarged. There is a small amount of mucopus in each middle meatus.

Throat.—The teeth are in very poor condition, with marked pyorrhea. The pharyngeal mucosa and posterior buccal mucosa are markedly reddened. The lower pharynx and larynx are covered by a profuse amount of mucus.

Esophageal Examination.—On swallowing liquids he coughs and chokes, nearly all the fluid being ejected. No fluid can be heard entering the stomach, and there is no gurgling in the neck. Choking comes immediately after swallowing.

The radiogram taken after swallowing bismuth and acacia mixture shows an S-shaped stricture of the esophagus; the convexity of the upper portion is to the right, of the lower portion, to the left. The middle of the stricture is at about the union of the manubrioclavicular articulation. The stricture apparently begins at the level of the lower margin of the cricoid cartilage.

April 21, 1916, the patient was esophagoscoped under cocain anesthesia, using the Mosher and Jackson esophagoscopes.

One and one-half inches below the cricoid cartilage was found a nodular mass on the right side of the esophagus. The lumen of the tube was very small and to the left of the mass. Pieces of tissue were removed from this mass with biters, for pathologic examination.

Carcinoma and tuberculosis of the esophagus.

Report of Doctor Albert on tissue removed from esophagus:

Gross Pathology.—The material to be examined consisted

of tissue scrapings, the mass of which measured about one centimeter in diameter, and individual pieces of which measured from two five millimeters in diameter.

Microscopic Pathology.—Certain pieces of tissue consisted of the normal squamous epithelial lining of the esophagus. Others, and more especially the largest piece, consisted of connective tissue and nonstriated muscle tissue invaded by a large number of solid masses of epithelial cells. These epithelial cells were of the squamous type. Many of the nests or masses of epithelial cells contained hornified epithelium in their centers, forming distinct whorls or pearls. The muscle or connective tissue invaded by the epithelial cell masses is markedly inflamed, as shown by a large amount of "round cell" infiltration, the round cells of which are principally fibroblasts.

Other pieces of tissue contained distinct tubercles consisting of central masses of beginning caseation necrosis surrounded by quite a large number of giant and endothelial cells, and about the periphery, large number of round cells consisting of fibroblasts and lymphocytes. The giant cells were of the typical tubercle type—that is, the nuclei were arranged about the periphery of the cells, whereas the center of the cells showed the homogeneous structure of caseation necrosis. In one field, fourteen giant cells were found. A few tubercle bacilli were also found. (Plate 986, Plate 986a.)

April 22, 1916, the Wassermann test on the blood was positive.

May 7, 1916, the tuberculin test (von Pirquet) was positive.

May 2, 1916, tubercle bacilli were found in the sputum by Doctor Royce.

May 15, 1916, smears taken directly from the larynx were reported negative for tubercle bacilli by Doctor Royce.

The blood examination on May 7, 1916, revealed the following: Hemoglobin, seventy-five per cent Sahli. Red cells, 4,900,000; white cells, 12,600. Differential count: Polymorphonuclears, seventy-one per cent; lymphocytes, twenty-one per cent; transitionals, two per cent; large mononuclears, four per cent; eosinophiles, one per cent; basophiles, one per cent.

The urine was yellow; specific gravity, 1008; acid; negative for albumin, sugar and sediment. Microscopically a few hyaline casts were found.

The patient was placed on antiluetic treatment April 24, 1916; mercury inunctions and potassium iodid. A marked improvement in dysphagia was immediately noticed.

By May 15, 1916, he was able to swallow all kinds of soft food and semisolids. He ate meat, potatoes, vegetables, and had no pain or difficulty while swallowing or afterwards.

Microscopic examination of the pieces removed from the esophageal tumor proved both its carcinomatous and tuberculous character. The marked improvement in the swallowing after antiluetic treatment alone, and in the presence of a positive Wassermann, suggests a definite luetic element present in this mixed tumor. Difficulty in swallowing twenty years ago, which lasted six weeks and then disappeared, is also suggestive of syphilis.

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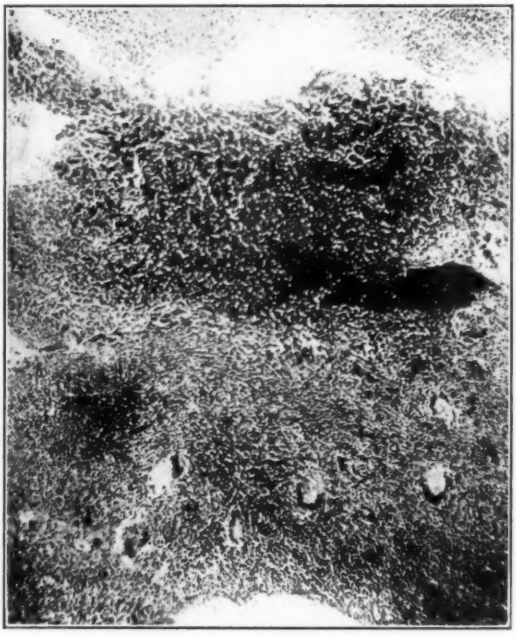

FIGURE 1.

Tuberculous portion of case of carcinoma and tuberculosis of the esophagus. (Plate No. 986.)

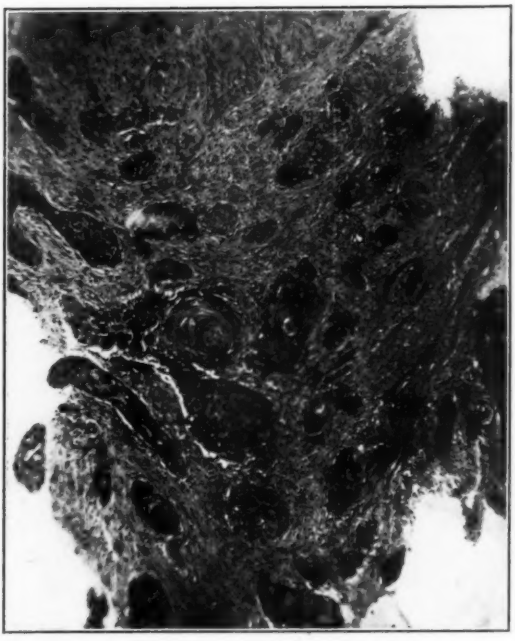

FIGURE 2.

Carcinomatous portion of case of carcinoma and tuberculosis of the esophagus. (Plate No. 986a.)

XXXIX.

STEREOSCOPIC ROENTGENOGRAMS OF THE HEAD.

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THE TECHNIC FOR MAKING STEREOSCOPIC ROENTGENOGRAMS OF THE HEAD.

BY

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Cleveland.

During the past five years we have had stereoscopic roentgenograms of the head made in all cases in which we have done any major operations upon the head. The longer we have used the stereoroentgenograms the more certainly have we been convinced of their practical value, for they give us definite information in regard to the nose and the nasal accessory sinuses, the brain and many of its blood vessels, the ear and the mastoid, which cannot be obtained in any other way. The size and boundaries of the maxillary and frontal sinuses can be distinctly seen. If there are any septa, tumors or foreign bodies in these cavities, they can be accurately located and defined. The ethmoidal and sphenoidal sinuses overlie each other, and are thus somewhat masked, but their position, relative to each other and the orbit and the other surrounding structures, can be clearly distinguished.

The location of malignant tumors and the amount of involvement of the structures by such tumors in the ethmoidal and sphenoidal sinuses is a little less definite than it is in the

frontal and maxillary sinuses, but in all cases it is much more definite and accurate in the stereoscopic plates than it is in a flat plate. Purulent infections in the sinuses usually cast a heavier shadow than the normal structures, and so are easily recognized, but occasionally a sinus with pus in it seems to transmit the roentgen rays nearly as well as an uninfected sinus.

Dimpling, or little depressions in the inner table of the skull, indicates increased intracranial pressure, and is almost positive evidence of brain tumor or abscess or hydrocephalus, except in microcephalic skulls. In such cases the dimpling is usually very evident and is due to the increased intracranial pressure within the abnormally small skull. The depth and extent of the depressions usually give some idea of the length of time that the increased intracranial pressure has been present.

The density or specific gravity of the majority of brain tumors and brain abscesses is about the same as the brain tissue, and so they do not cast any shadow in the roentgenogram. If the tumors are dense or calcified, they can be accurately located. If a brain abscess is encapsulated, its shadow will usually show in the plate, and in some cases the abscess may be very definitely outlined.

Skill in interpreting the roentgenograms can be more easily acquired by the surgeon than by the roentgenologist, for the surgeon has the decided advantage of being able to verify and correct the findings in the roentgenogram while he is operating. If the surgeon will carefully study the stereoscopic picture before operating, compare his interpretation of the picture with the condition which he finds in the operation, and then study the picture again after the operation, he will soon acquire great skill in interpreting the stereoscopic plates.

The study of stereoscopic plates of a macerated skull shows distinctly all the principal anatomic points, and enables one, otherwise unfamiliar with stereoscopic plates, to recognize easily the landmarks in the picture of the living subject. In studying stereoscopic plates they should be examined from both sides. First, put the plates in the stereoscope with the film sides toward the mirrors. This will show the structures as we see them in the operation, with the external parts in

the foreground and the deeper structures in the background. Then by reversing the plates in the stereoscope, turning the smooth sides of the plates toward the mirrors, the structures will be seen from the inside of the skull.

I have with me for demonstration in the stereoscope the following plates:

Macerated skull, anterior-posterior view, showing all the accessory cavities of the nose.

Plates showing both mastoids of this skull at the same time. Copper wires have been placed in the semicircular canals of the right labyrinth so as to identify them positively. The advantage of taking both mastoids on one plate is selfevident. If only one mastoid is infected, the uninfected mastoid serves as a normal standard, so that both the normal and the infected mastoid can be studied and compared at the same time.

Plates showing an osteoma which developed in the left frontal sinus and extended into the right frontal sinus, both orbits, both nasal fossæ and the brain cavity, in spite of an operation during the early development of the growth, in which I thought I had removed all the tumor.

Plates showing a bullet lodged in the right mastoid antrum after it had passed through the left orbit and posterior ethmoidal cells, the right sphenoidal cavity and temporal lobe of the brain. The course of the bullet can be traced distinctly through these structures in the stereoscopic picture. I removed the bullet in a radical mastoid operation.

Plates showing a calcified tumor of the cerebellum, about three and one-half centimeters long and two centimeters thick. This case was under Dr. George W. Crile's care at Lakeside Hospital, and I saw it in consultation. The patient was in exceedingly bad condition when he was admitted to the hospital. Dr. Crile did a decompression operation, but the patient died later.

Plates showing temporosphenoidal abscess with gauze for drainage in the abscess cavity. The abscess was secondary to a chronic suppurative mastoiditis, and was located in the stereoscopic plates before the operation. I opened and drained the abscess through the mastoid wound. The plates which show the gauze in the abscess cavity were made one week after the operation. The patient recovered completely.

Plates showing necrosis over the sigmoid sinus secondary to an acute otitis media and mastoiditis. This case was promptly operated upon and recovered, although he had a beginning meningitis when he was admitted to the hospital.

Plates showing a tumor of the hypophysis extending into and nearly filling both sphenoidal cavities. This patient was nearly blind when he was admitted to the hospital, and refused any operative work except a decompression. This relieved his eye symptoms and headache.

The following description of the technic for making stereoroentgenograms of the head was given to me by Doctors Hill and Thomas, roentgenologists in the Medical Department of Western Reserve University.

TECHNIC FOR MAKING STEREOSCOPIC ANTEROPOSTERIOR RADIOGRAPHS THROUGH THE FRONTAL SINUSES.

The special apparatus needed for this purpose consists of a stereoscopic tube stand, a plate changer and an inclined plane the angle of elevation of which is about twenty-three and one-half degrees.

The plate changer is adjusted by means of the inclined plane so that it lies on the table at approximately twenty-three and one-half degrees elevation from the plane of the table. The tube is centered vertically, in reference to the table, over the middle point of this plate changer, and then adjustments are made so that when the tube is moved one and one-fourth inches to the right or left and the tube holder tilted, the central ray will strike the same point on the plate changer.

The patient is then placed on the table, face downward, with the forehead at the upper portion of the plate changer and the glabella over the central point. Care must be taken that the head lies squarely on the plate changer, so that the midsagittal plane through the head is at right angles to the plane of the plate changer.

The movement of the tube from one side of the head to the other is at right angles to this same midsagittal plane. The exposure made with the tube moved one and one-fourth inches to the right and the tube holder properly tilted, as above mentioned, will produce the right eye image, and the exposure made one and one-fourth inches to the left of the

median line will produce the left eye image. The exposures are made during suspended respiration.

A compression cone diaphragm the size of the No. 1 Kelly-Koet diaphragm is used, and a heavy leather filter is placed over the patient's head.

TECHNIC FOR MAKING STEREOROENTGENOGRAMS OF BOTH MASTOIDS ON A SINGLE PAIR OF PLATES.

The patient lies on the table, on the left side, with the side of the head resting on a small table which is lead lined except over an area five inches wide across the center of the table. The ear is turned forward to prevent the shadow of the cartilages of the ear obscuring the roentgenogram of the mastoid. The head is placed so that the mastoid lies over a centering spot on the middle section of the table where there is no lead lining.

The tube is placed so that the line of the principal ray passes through the head at an angle of twenty degrees above a line through the auditory meati.

The stereoscopic adjustments have been made before the head is placed on the head table so the line of the principal ray shall always focus on the centering spot over which the mastoid is placed. Then on the left half of one eight by ten plate, marked "R" for instance, the right eye roentgenogram of the left mastoid is made. This plate is then removed from the slide in the head table without the patient's position being changed, the tube is shifted for the left eye image, and on the left half of a plate marked "L," is made the left eye roentgenogram of the left mastoid. The patient is then turned on the right side with the right mastoid placed over the centering point as was the left, and on the right half of the plate marked "L," the left eye roentgenogram of the right mastoid is made. This plate is then removed, the patient remains quiet, plate "R" is inserted in the slide of the head table so the exposure will come on the right half of the plate. The tube is shifted for the right eye, and a roentgenogram of the right mastoid for the right eye is made. This gives right eye roentgenograms of each mastoid on the plate marked "R," and the left eye roentgenograms of each mastoid on the plate marked "L."

These plates, when developed, are placed in the stereoscope

with the one having the right eye images in the right light box of the stereoscope, and the one having the left eye images in the left light box. With the glass side of the plates turned toward the mirrors of the stereoscope we view the mastoids from the inside of the skull, while with the film side of the plates placed toward the mirrors we view the mastoids from the outside of the skull.

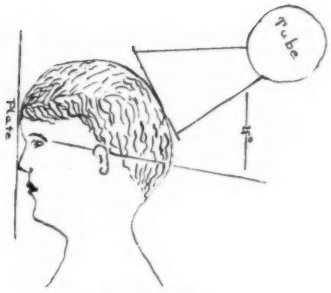

FIGURE 1.

This shows the position of the patient's head on the plate and the angle at which the tube is placed for taking stereoroentgenograms of the nasal accessory sinuses.

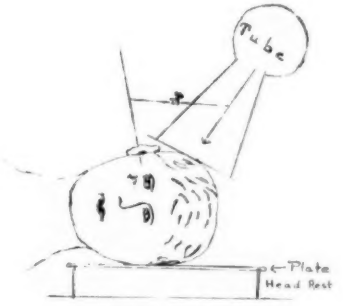

FIGURE 2.

This shows the position of the patient's head and the angle at which the tube is placed for taking stereoroentgenograms of the mastoid.

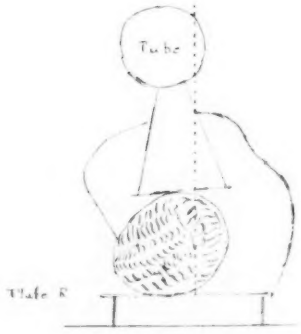

FIGURE 3.

Position No. 1. Right stereo of the left mastoid.

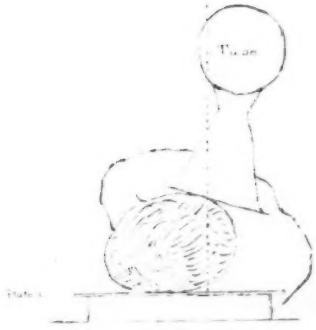

FIGURE 4.

Position No. 2. Left stereo of the left mastoid.

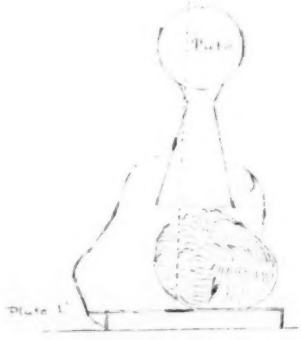

FIGURE 5.

Position No. 3. Left stereo of the right mastoid.

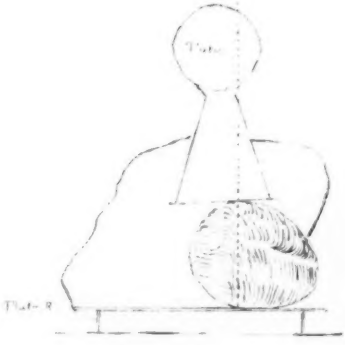

FIGURE 6.

Position No. 4. Right stereo of the right mastoid.

XL.

VOICE PRODUCTION FROM THE STANDPOINT OF THE LARYNGOLOGIST.*

By Hampton P. Howell, M. D.,

New York City.

Voice production is a rather hazy subject to the average laryngologist, unless he has devoted especial attention to it.

It would seem, therefore, that a short article on the principles of voice production and a consideration of its treatment relative to those who take up singing as a profession would prove of some value.

The writer's interest in this department began a dozen years ago, when he became an associate of one of the former presidents of this society, a man whose name is inseparably connected with the world of singers.

With the artistic side of the matter the laryngologist has nothing to do, but the physical effects of vocal methods do enter decidedly into his province.

Actual diseased or deformed structures throat specialists agree upon, but not so with functional conditions. By the laryngoscopic mirror alone we can no more pick out a noted tenor than we can an expert tennis player by examining his arm. In fact, by no means, does every singer of reputation have a pair of cords of normal pearly gray color. They may be somewhat dusky in hue, and the whole larynx may appear congested, and the thickened tissue in the posterior commissure be abundant enough to border on the pathologic.

In gross deformities and evident inflammatory diseases of the nose and throat, it is not difficult to decide on the best course of treatment. But in the complaint of a singer it requires very nice judgment to determine that a moderate

*Candidate's thesis to the American Laryngological, Rhinological and Otological Society, May, 1916.

hypertrophy of the lower or middle turbinal body, or that a slight thickening or deviation of the nasal septum, is the cause of the trouble. Nor can we say the disturbance is due to the shrunken remains of an adenoid.

Are you going to extirpate the slight enlargements of the lingual growth which you see?

Can you state positively that her small tonsils are diseased or interfere with the muscular action of the palatal curtain?

To the vocalist these decisions are of the utmost moment, for on the result of your sentence may rest an artist's future, especially if your management of the case demands operative means.

Considerable careful reading and practical experience, in the conditions common to singers and speakers, is necessary for any laryngologist who wishes to undertake this kind of work.

Of course, Tyndall's classic on "Sound," and von Meyer on the "Organs of Speech" are of fundamental value.

Of those authors who address themselves particularly to the departments in which we are interested, we would recommend especially the books of Sir Morell MacKenzie, H. Holbrook Curtis and Wesley Mills, dealing as they do with the mechanism and hygiene of the voice.

Too many of the treatises on these subjects have been written by singers and teachers, often of great renown, which appeal to the vocal student but do not handle the matter enough from the physiologic standpoint for a physician to follow.

The laryngologist should himself take lessons in singing and elocution and listen to instructions given to pupils. Much can be learned also by attending studio performances, the opera, and the study of the phonograph. Discussions, also, with those who are able to criticise the manifold problems and subtleties of voice method are highly profitable.

By such a course he trains his own vocal organs and his musical ear, so that he can not only test out a voice, but illustrate and give an exercise for a pupil to imitate with some degree of confidence. He will be able, also, to understand the sensations and feelings so often described by a teacher or

singer, to explain his ideas in connection with the production of tones.

Correct breathing is the basis of good singing; but the demands are quite different from those that are required for purposes of oxidation. We must take in air quickly and without noise, to meet the needs of the most exacting vocal phrasing. But more important than inspiration is proper expiration; how best to attain an even outflow of air under complete control, to permit just enough breath for the sound and no more, as demonstrated by the well known candle experiment —not a flicker of the flame held a few inches from the mouth during the emission of a sound.

Physiologic studies have demonstrated that the type of respiration so successfully used by the old Italian school is the one most preferred today. It earned its position among those natural teachers because it permitted the largest expansion of the chest with the best control of the air in expiration. This has been termed the "inferior costal type of breathing."

The socalled "upper chest," "diaphragmatic" and "abdominal" styles have all had their vogue at various periods. Each of these methods probably has a few supporters even now.

It is to be hoped that in future there will be a greater agreement on the underlying principles of voice production; that gradually there may be a closer cooperation between teacher and physician, all working towards a standardization in our methods of training voices.

To illustrate the "inferior costal type of breathing"—stand erect but not rigid, the shoulders gently thrown back, and somewhat raised, the upper chest immovable and the lower abdomen slightly contracted.

This position permits the best support in expiration, as the diaphragm is thus held tense and alert, allowing a continuous outflow of the air stream, with no unsteadiness or jerkiness. Having the upper chest, as it were, suspended and fixed, regardless of the posture of the singer, any demand made on the voice can be met.

While in everyday life we urge breathing through the nose, in the act of singing or making an address the case is different. Now we must breathe through the open mouth. Otherwise we could not take the air in rapidly enough. This meth-

od tends also to keep the tongue down in the floor of the mouth, with the necessary groove running back through its middle; and the laryngeal box is not pulled upwards, with a consequent tightening of the muscles of the neck.

The volume, or bigness, of a sound depends on the amplitude of its vibrations. A big bawling sound is most unpleasant to the ear, and it soon tires the auditory nerve.

Pitch depends on the number of vibrations in a given period. The healthy ear can distinguish sixteen vibrations per second as its lowest limit, and thirty-eight thousand for its highest. This is a stretch of eleven octaves. However, musical instruments have a range of seven octaves; and much of this is too high to cause a pleasing sensation on our centers of audition.

The average person can sing but two to two and one-half octaves, while in speaking we confine ourselves to a half octave of the middle voice.

The quality of a tone is affected largely by its overtones and harmonics. The blast of air through the glottis, in the case of the voice, sets the vocal bands in motion. This produces the primary sound. This simple neutral sound is somewhat enhanced by the ventricles of the larynx; it gains still more from the pharynx and buccal cavity; the low notes bring the chest walls into vibration as an additional resonator.

The peculiar quality or timbre of the individual voice arises from the accessory sinuses and the bony framework of the face.

Sometimes we are surprised to find in a robust man a small, squeaky voice. This is usually due to poorly developed facial cavities. The Maori of New Zealand possess peculiarly dead voices, though they have magnificent physiques. Anatomic researches show the lack of resonance in their voices is due to an underdevelopment of their accessory sinuses.

As a sound-producing apparatus the larynx is unique. Though comparable to the reed instrument, in the perfection and economy of its mechanism, it far surpasses it. This superiority is due to the fact that by the marvelous action of the laryngeal muscles a single modified reed can take the place of a great many, so placing in the confines of this small box a potentiality not to be found in a cathedral organ.

In the production of sound the larynx is steadied by its extrinsic muscles. During the utterance of deep notes, it is found to occupy a slightly lower position and rises in the ascending scale. The entire distance moved, however, is probably not over the fourth part of an inch. This rise and fall can be easily appreciated by the fingers on the thyroid cartilage during phonation.

Both in speaking and singing in the lower range of the voice, the cricothyroid is the chief muscle. Therefore we find it more used in men than in women, and in basses and baritones than in tenors.

By approximating the anterior part of the cricoid cartilage to the thyroid, it has the capacity of lengthening and making tense the vocal bands. This action can be noted when singing an ascending scale; for one can observe the arytenoid cartilages to move backward and almost out of sight, while there is at the same time a sinking of the posterior parts of the cords.

The thyroarytenoid muscle has a far more complicated action than that of merely drawing the arytenoid cartilage toward the thyroid. The inner fasciculus probably regulates the degree of tension and the elasticity of the vocal cords, possessing, also, the peculiar power of dampening the edges of the bands, just as a finger shortens the string of a violin in a high note; while the other fasciculus, on the other hand, narrows the rima glottidis—that is, it brings the borders closer together along their entire length.

The lateral and posterior cricoarytenoids, when acting alone, respectively approximate and separate the bands, but with the other laryngeal muscles they may operate as tensors.

When singing a high note the arytenoideus closes the posterior part of the glottic chink.

As the highest notes are reached there is also sphincter action about the entire superior orifice of the larynx, the whole organ appearing appreciably smaller.

If you ask a trained singer to run a scale from his low to his high notes, you will notice that when he reaches a certain point in his middle range a change begins from now on in the quality of his voice. It loses a certain loudness and open-

ness and, as it were, sounds more covered up in the inside of the head.

This bridging over from the lower or chest notes to the head or covered notes may occur with a smoothness that makes the process unnoticeable, while on the other hand, the transition may be so pronounced that it causes a "break" in the voice. This alteration from a lower to a higher voice is designated as a change in the registers of the voice. Just as there is a change of gears in an automobile to accommodate itself to a change of speed, so there is a change of mechanism in the voice to adapt itself to the change in pitch.

According to Behnke, "a register is a series of tones which are produced by the same mechanism." A new register marks a change in the quality of a tone corresponding to the change in mechanism, and at the point where that variation occurs we term it the "break" in the voice.

In listening to a Sembrich there is such a perfection of method, gained through years of study, that an entire composition may be sung without the audience being aware of any such thing as registers.

Some teach that there are two registers, others three or even five. In fact, for every variety of note a different adjustment is probably required, though too slight to be perceptible.

But for practical purposes we can regard two registers as sufficient. We can add as a third the falsetto, which is not a genuine tone. This is a very high note of clear bird-like quality produced by male singers. It is created without the diaphragmatic support of the air column, and there is no dampening of the vocal bands in its formation; they are apart throughout their whole length, the vibration taking place on the very edges of the cords, if we are to believe Lehfeldt.

In the production of the falsetto there is a sudden readjustment from the previous high but natural note, followed by a sense of comfort in its performance. If well executed, or better, well disguised, it may prove of great utility on certain occasions.

To recapitulate: During phonation in the lower and middle range the vocal bands do not touch, as the cricothyroid is a tensor muscle, and the intrinsic muscles do not come into play during this part of the mechanism.

But as the scale ascends the cartilaginous glottis is closed by the arytenoideus, the cords come together more and more, both anteriorly and posteriorly, till on the very highest notes only a small oval opening is evident in the front third of the glottic fissure. It is at this period that the thyroarytenoid is effecting its complex adjustment, acting in conjunction with the lateral and posterior cricoarytenoids.

If the falsetto voice is used the cords again return to their original position; that is, apart for their entire length.

As previously stated, to give one an understanding of the application of registers, without some practice under a teacher, is most difficult.

There are certain terms used in the singing world of which we as laryngologists must gain a working knowledge. The covered voice was described with the discussion of registers. We should appreciate the difference between singing "too white" and "dans le masque." In the former method the voice is brought too far forward in the mouth; the tones are clear cut but colorless, and they do not charm, for they lack overtones. In the tones sung too "dans le masque" the voice is confined in the facial cavities, and where we have this to excess the quality of the tones becomes too covered and "hooty." This shuts up the voice, prevents singing high notes and interferes with clear diction. This is not a difficult fault to rectify, but sufficient to keep a good voice in the ranks of mediocrity, if continued.

The term "stroke of the glottis," or "coup de glotte," originally referred to the correct attack of a tone, the proper adjustment of the tension of the vocal cords to the column of expired air. Its meaning now is quite the opposite: a sudden attack with the throat muscles rigid and the vocal cords overtense, with margins that touch along their middle in the production of the sound. This is a serious fault, and one that is certain to bring disaster to the voice.

The tremulo in good singing today is never justified, and ordinarily we find it is a defect due to an uncertain attack and a poor respiratory support.

Far more than the actor, a singer must hold his emotions under control. The gallery loves a throbbing open tone on a top note, but the man who commits this injury to himself will soon require the throat specialist.

At what age should vocal lessons begin? We may answer: At any time; the earlier the better, but with strict limitations in the compass of the voice, as at a tender age the organ cannot withstand the strain of unusual effort.

Still we must bear in mind that in early life the memory and initiative faculties are at their best, and these natural characteristics should be taken advantage of.

Choral singing, in our institutions, on the other hand, is harmful. For, though it may teach the elements of music, no attention is given to tone placement; the pupil sings beyond his range, and each one tries to outdo his neighbor. This procedure often results in voice strain and blasts forever an innately excellent organ.

Were an attention, at all proportional to its importance, given to expressive reading and elocution in our schools, we would not find so many adults with wooden voices and slovenly methods of speech. What greater possession than a well modulated voice and clear enunciation. And yet how few appreciate these facts?

We must employ great judgment in advising the use of the voice during the early period of adolescence, when the larynx is undergoing its most rapid growth. If the alteration is gradual, moderate exercises may be permitted, but within prescribed limits. Voices, however, which are unsteady or husky at this age, which often "crack," show evidences of laryngeal congestion, and in such cases singing or any harsh use of the vocal apparatus must be interdicted for a year or more, if necessary.

Really not until the age of twenty-three or four does the larynx reach its full development, when it is competent to endure serious vocal training.

Every laryngologist should know several reliable vocal teachers, to whom he can intrust his musical patients.

In the fundamentals of voice production, we can state that a man is the better teacher for a man, and a woman for a woman.

Be most particular in the selection of your first teacher, for a pupil should be so trained from the beginning that he will not be compelled to unlearn incorrect methods later on. Studios are filled with those who have made such a mistake.

Ordinarily one can judge best of a teacher by the recognized results he has had with his pupils.

Do they sing well? Do their voices improve? These are the first questions to ask.

Remember, we laryngologists are not singing teachers. With the divine art of song we have nothing to do in the consulting room. But whatever pertains to the actual voice, the effects from good or bad instruction, as noted on the vocal apparatus, do decidedly fall within our jurisdiction.

To excel as a teacher he must know his subject, have unbounded enthusiasm, and possess a sympathetic insight into the needs of his pupils.

It is unnecessary for him to be an eminent singer. In fact, the drudgery of teaching tone work would very often be repellent to anyone fitted for the concert, stage, or opera.

Still he must have a voice so trained that he can demonstrate a correct tone, and it is a great advantage to imitate a student's own mistakes and then to sing the part faultlessly to him. It is often far superior to a long explanation and better keeps up the interest of the pupil.

The best teacher depends on his ear, and not on the laryngoscope. He should not regard himself as an instructor of anatomy and physiology. To indicate any more than the gross divisions of anatomic science to a pupil will not assist him; rather, it will make him overconscious than otherwise.

To bully and tyrannize over his pupils is absolutely wrong; for a singer's nature is altogether too sensitive to endure such rough measures. The nervous organization of one of our great singers is of different mould from that of the humdrum individual. We average mortals try to explain that difference by the words "artistic temperament." At any rate, we know an artist possesses a spark that reaches out into spaces quite unknown to most of us.

If a pupil fails to make progress, if he is hoarse after his exercises, has difficulty in understanding his teacher, and is becoming discouraged, you can be certain that he must find his instruction with someone else.

Let us now consider a few types of cases such as a throat man might have visit his office.

Case 1 is that of a young man, a tenor in a church choir.

He states that his first teacher considered him a baritone who had some tenor notes. With this man he made excellent progress, and his exercises and songs were kept well within his range. Two years ago he met a teacher who classed him as a robust tenor. This prospect seemed too alluring to neglect, so he put himself under his direction. For a time he improved, at least he said his range was higher by several notes; and though he had not yet reached high C, he hoped soon to do so.

His first serious trouble began when he received a church position. The music always seemed too high for him, though by an effort he got through his parts. Of late, however, he noticed a tremulo in his voice, and a certain unsteadiness, and often after a performance his throat ached, and there was a huskiness in speaking. He also added that he is now losing his lower notes, and that the general quality of his whole voice is not so good.

You ask the young man try a scale and you find his higher notes lose their freedom; they sound pinched. Having him run down the measure, you recognize at once that here lies his natural voice, though it sounds wooden.

On examining his nose, you find a high deviation of the septum, while the cords are somewhat wavy in outline—and that in singing a high note on "Day" or "Hay" you see the glottis is open its entire length.

Such an examination clearly proves that this patient is not a tenor; that he has been forcing his voice so that the inner fibers of his thyroarytenoid no longer act. The "long reed" type of glottis still further confirms the idea that the patient has a voice of medium range only.

The high septal deformity does perhaps interfere with his highest notes, but as those do not belong to his natural range, no operation on the septum is necessary, especially as the septum is producing no other symptoms.

The conclusions to be drawn are evident. The man has attempted to outdo nature. You cannot create a voice; you can only improve the one you already possess.

Let his voice drop back to the place where it properly belongs, and again he will sing as he did formerly, as thus far no permanent injury has been done.

Case 2 is that of a young comic opera star, whose company opened two weeks ago. After singing for a week she thought she had contracted a slight cold. Her middle voice and piano notes are poor, while her high notes are as good as ever. She is hoarse after a performance.

Her nose and pharynx manifest slight evidences of congestion. The larynx is in the same condition; the cords have a dusky hue and bulge towards the center. On light phonation one observes a single spot just anterior to the middle where the mucus adheres. Under this on the margin of each cord is a minute tumefaction with an area of redness about it. Closer study of these growths shows them to be the size of a pin-head; they appear harder than the surrounding tissue, and seem embedded in it. Their location is exactly at the point where the bulging cords touch.

The diagnosis is a traumatic laryngitis with singer's nodes, due to faulty voice production.

The supposed cold is merely the congested state of the upper respiratory tract resulting from the voice strain.

In such cases the upper notes remain clear, because when the cords are tense the edges do not rub. But in the middle voice and piano notes, the cords are relaxed and at their most convex point, from the attrition of the edges, the nodules quickly develop.

In all cases of vocal disability due to voice strain, examine for the bulging margins of the bands.

The little vibrating pearl of mucus reveals the point of origin of the vocal nodule.

Light opera music is not written with the thought of saving voices, but rather for striking vocal effects.

Is it any wonder that the prima donna, often selected for her beauty and youth, breaks down early in her career? It takes six years of painstaking work to prepare a singer for the operatic stage—and yet for a light opera the principal star is frequently selected before she has grasped the rudiments of voice culture.

What are the indications for treatment in a case of this kind? Local measures and prolonged rest, you may say.

Applications, inhalations and sprays have little effect, except to soothe or act as slight counter irritants. Prolonged

rest is out of the question with this class of people. They must sing or they lose the place they have so labored to attain.

The exercises instituted and developed by Dr. H. Holbrook Curtis bring the most satisfactory results in the shortest time. Numerous articles of his have thoroughly explained this method of treatment in the voice strain of singers.

The general idea is that instead of giving the vocal organs complete rest, the patients are to be given exercises to counteract the damage done—in the same fashion as one who has tired his arms by climbing a rope can quickly restore their elasticity and vigor by using the punch bag. For wrong methods of singing, which brought the cords together, are substituted those that exercise and in a way massage them, but do not permit them to touch.

The patient is requested to whisper instead of being allowed to talk. He is to practice humming exercises every hour during the day for a few minutes.

To briefly describe the technic of performing the hum: We have the patient sip in some air through the mouth, then close the lips, with the teeth a pencil's breadth apart, think of the word "maw" or "naugh," in the most comfortable pitch of his middle voice, and then first sing the word in the closed mouth, bringing it forward till you can feel the lips vibrate with the sound, when by flecking the under lip the explosive note "maw" or "naugh" escapes.

By ascertaining in this manner that the sound is correctly placed, let it, as it were, burst through the lips. It should be clear and even. After some practice he can go up and down the scale with it, and then in a day or two he may try his songs, using, however, the word "maw" at first in place of the words of the song.

In a remarkably brief period voices have been restored by this method, and the patients been enabled to return to their occupations.

Case 3 has many of the symptoms of the former patient: the voice tires easily; it is losing its attractive quality, and there seems a certain breathiness of tone.

By laryngoscopic examination you find cords that are neither wavy in outline nor bulging. Instead, they are bowed, with an elliptical opening.

Such a condition arises from voice strain also; too much air is used in the production of a tone, till finally the thyroarytenoid muscle, yielding to the strain, causes the oval opening of the glottis with a weak, breathy result. It can be occasioned, too, by practicing exercises excessively that contain too many open vowels.

The principles of treatment here are to properly apportion the amount of air to the needs of the voice, and to make use of the exercises suggested for the benefit of the previous case.

It is to be hoped by the writer that even though every laryngologist is not endowed with a keen musical taste, he need not consider that the subject belongs to a domain in which he can have no part; that he will discover, by applying his anatomic and physiologic knowledge to the principles of voice production, and by training his own ear and voice, he may find this branch of his specialty of increasing interest and profit to himself as well as to the vocalist.

XLI.

INTRANASAL DRAINAGE OF THE FRONTAL SINUS.

By E. Fletcher Ingals, M. D.,

Chicago.

History: The first references to intranasal drainage of the frontal sinus that I can find are in Jonathan Wright's "History of Laryngology and Rhinology," from which I quote: "Ogston in 1884 declared that there was no possibility of introducing a probe into the frontal sinus from the naris; but subsequent work slowly demonstrated the error of this dictum."

Schaefer in 1890 proposed to drain the frontal sinus by enlarging the nasofrontal duct. He was followed by Winckler in 1892, and in 1893 Lichtwitz again urged the practicability of this operation, but for years the idea was discredited by most writers as dangerous or even impossible; but Winckler's work in 1892 did much to show the practicability of the operation. However, on account of the difficulties he experienced in passing a probe through the nasofrontal duct, he recommended piercing the floor of the sinus between the anterior end of the middle turbinate body and the septum, for which he used a curved sound with a dull point.

In 1898 Scheier reiterated that it was practicable to enter the frontal sinus through the nasofrontal duct.

Spiess also advocated the procedure in 1899. However, none of these operations found favor with the profession, and, as stated by Wright, "when an operation was necessary, the whole drift of opinion for ten years was toward gaining access to the sinus by means of an external operation."

After giving due credit to many workers for the development of the external operation, Wright refers to the symposium at the meeting of the American Laryngological Associaition in 1905 on diseases of the sinus and the operations for its alleviation. He mentions my report at that time, and subsequent reports by myself and Skillern in 1907 and 1908.

In 1906 Halle of Germany reported operations on ten persons, for enlarging the nasofrontal duct by an electrically driven burr, in which operation he protected the internal and posterior walls of the cavity by a flattened director, held internally and behind the burr. In this paper he refers to the methods of Schäffer, Hajek and Grünwald, by introducing metal sounds into the nasofrontal duct after removing the anterior third of the middle turbinated body; but he considered the operation difficult and often impossible. However, none of these really enlarged the drainage canal. In this same paper he referred to my operation as the only one that completely opened the nasofrontal duct; but he thought it dangerous on account of coming too near the tabula interna, a fear which my experience has demonstrated to be unfounded.

In 1908 R. H. Good of Chicago, and Vacher in France in 1910, advocated intranasal drainage. Referring to the internal operations advocated by these various writers, Wright says "they met with considerable criticism; but there is no doubt that in selected cases it has become the operation of choice with many rhinologists." In 1910 J. A. Thompson of Cincinnati proposed enlarging the nasofrontal duct by means of bent rasps. Good used rasps, chisels and biting forceps to cut away the nasal crest. Thompson, in his operation, designed to have the mucous membrane on the posterior aspect of the canal left intact, to promote quicker covering of the enlarged canal with mucous membrane. He also used a director and had a groove on the back of his pointed rasp which he works along this director so that he may enter a smaller nasofrontal duct than could be done with the Good rasps. Segura in 1912 and Sullivan and Denis the same year advocated changes in the operations which they considered useful advances.

In 1912 H. P. Mosher, at the American Laryngological Association, recommended breaking through the anterior end of the middle turbinated body with a curette and working outward, backward and downward, breaking down the cells and the nasofrontal duct which is surrounded by them, destroying both the cells and the duct at the same time. He says: "Very little curetting is required to convert the anterior part of the labyrinth into a single cavity. In the roof of this

chamber, usually in the anterior outer angle, the opening of the nasofrontal duct is placed."

In 1914, in the *Journal of Laryngology, Rhinology and Otology* for May, P. Watson-Williams, in an excellent article, presents a good historical sketch of the intranasal operation, with fairly accurate descriptions of the various operations, and describes his modifications of the other procedures. In the same number Herbert Tilley described his method, and refers with praise to Mosher's operation. He takes the position that when any operation is necessary an efficient intranasal operation is to be preferred unless symptoms indicate intracranial complications, unless necrosis or osteomyelitis are present, or unless ocular complications render a radical operation necessary; but he admits that anatomic conditions may interfere with the intranasal operation, and he calls attention to the fact, now commonly recognized, that not a few cases of frontal sinuitis require no operation at all, and that others recover promptly after removal of the anterior end of the middle turbinated body.

In 1915 Dr. O. T. Freer presented a paper to the American Laryngological Association, on opening the frontal sinus through the nose. He gives a careful exposition of the anatomy, and points out the dangers both of rasps and burr, but states that the latter properly used is a safe instrument. He thinks the drainage canal usually obtained is too small and becomes constricted by cicatricial bands. However, this cannot occur if the gold drainage tube is left in position, as I recommend. He favors enlarging the ostium backward through the foveal ethmoid cells, which may be easily broken down. He recommends numerous probes and small curettes which he uses in cleaning out the ethmoids and frontal sinus. He states that there is very little danger of perforating the cranial covering of the ethmoid cells, which is hard, though thin, unless it is directly attacked. Externally, however, the orbital wall is frail and is liable to perforation in any of the intranasal operations.

Without disparaging any of these operations, they do not appear to me to make adequate provision for keeping the canal open, excepting by its large size, and as we know from experience with other accessory nasal sinuses there is a strong

predilection for closure of artificial drainage openings, even though these may have been large.

Many laryngologists have considered it necessary to curette the frontal sinus in nearly all cases to remove hypertrophy, polypi, degenerated mucous membrane, exuberant granulations, and what Herbert Tilley calls the pyogenic membrane, but I am pleased to find that Freer agrees with the opinion I have held since the early days of intranasal drainage. He says: "At first I was also under this impression, but experience has shown me that not only are these advanced degenerations exceptional, but that the mucous lining of these sinuses is usually normal in appearance, and that even if the pathologic changes mentioned do exist, they are capable of disappearance under the influence of good drainage and ventilation unless there be caries of the bone or large polypi present." He does not, therefore, favor systematic destruction of the mucous membrane, which he thinks would prolong the period of recovery and suppuration. I heartily agree with this view, and from experience believe that in a large majority of cases free drainage is all that is necessary, and that vigorous curettage is a bad practice, although gently removing polypi or granulation tissue with the curette, when these are present, would undoubtedly hasten the cure.

In 1905 I gave a careful description of my operation, and it has been described by several others in journals and textbooks with varying degrees of inaccuracy. I would not write about it again had it not been for a grotesquely inaccurate report of some remarks I made on the subject that appeared in an abstract of our proceedings of two years ago. This report muddled the whole matter beyond recognition by anyone not fully familiar with the operation. But there are also some new points suggested by my experience that are deserving of notice.

I hope now to make the matter so clear that the operation can be readily and safely done by anyone qualified to practice laryngology and rhinology. The furor for extensive mutilating operations on the frontal sinus has had its day, reached its zenith, and declined until now a large number of laryngorhinologists favor more conservative intranasal drainage in suitable cases, and have come back to the well known princi-

ple held by our forefathers, viz., that a suppurating cavity properly drained will usually heal if meddlesome surgery is avoided.

In 1893 I had under my care two cases of chronic long standing suppuration of the frontal sinus. Both of these patients lived out of the city, and they came to me irregularly at intervals of weeks or several months. I gave them such relief as possible by detergent washes and occasional washing out of the frontal sinus, but neither of them would consent to an external operation. Finally, in one of these cases, by repeated washing out of the sinus daily for a short time, and after a couple of weeks less frequently, and by following this washing with a five per cent solution of protargol injected into the sinus, I succeeded in effecting a cure, although the disease had persisted for twelve years. There was no recurrence of the empyema in this case.

In the other case it was not so easy to treat the sinus locally, and for a long time I pondered upon some effective method for enlarging the nasofrontal duct.

In 1895 the late Dr. A. W. Palmer of New York devised a frontal sinus drill which was described in the *New York Medical Journal*, March 2, 1895. This drill was illustrated in the third and fourth editions of Dr. Kyle's book, and in the third and fourth editions of my own work. It possessed some elements of success, and at first sight appeared practical; but it had no safety guide to confine it to the nasofrontal duct, and I do not know that it was ever used. At any rate, it did not obtain popular recognition. I think, however, that I must be in a way indebted to Dr. Palmer for the idea which finally evolved into the burr which I invented. I concluded that if a perforated, bead-like burr could be devised to be run into the nasofrontal duct over a small director, or safety guide, this duct could be enlarged so as to furnish adequate drainage. After several experiments I succeeded in developing such a burr that filled the requirements and that has needed no material alterations. I tried this out on the cadaver, and had it altered as needed until I was finally satisfied. This burr made a canal six millimeters in diameter; and the guide was so arranged as to prevent any danger of the burr passing through the posterior wall of the frontal sinus. But I soon learned that a canal of this size left to nature would not remain open

more than a few weeks, therefore, I fashioned a metal tube that I inserted into the canal, which I hoped to keep in place by bending out sections of both its upper and lower ends.

On March 25, 1904, I operated on the first living subject by this new method. This was the second of the two who had so persistently declined external operative measures. The drill worked perfectly and a good drainage canal was quickly formed, but I had much more difficulty than I had expected in placing the drainage tube; indeed, it was a failure, and I had to remove it after a couple of days. The canal in this case had so far closed at the end of five or six weeks that all of the old symptoms returned, and I found that only a very small director could be introduced.

In the meantime I had perfected the spring-gold self-retaining tube that I still use. Introducing the small steel guide, I ran in the burr again and then inserted the gold tube, which gave perfect drainage and allowed the patient herself to easily wash out the frontal sinus. As a result the sinus completely healed in a few months, although it had been suppurating for sixteen years. The patient was so timid and so feared a return of her old headaches that she would not permit me to remove the tube until she had worn it three and one-half years, although it had not been needed for more than about three months, for in that time the drainage canal had been completely lined by mucous membrane and there was no possibility of its closure.

As has been aptly stated by someone whose name I cannot recall, the efficiency of an operation is not determined by what can be done with it by its author, but by what can be accomplished with it in the hands of other surgeons. I am convinced that my operation can readily be performed by any properly equipped laryngologist, and that it will prove effective in nearly all cases of chronic suppuration of the frontal sinus; indeed, I have placed the percentage as high as ninety-five per cent of suitable cases, and I have no reason to modify this statement; but of course in a pansinuitis involving the ethmoids and sphenoidal sinuses it cannot be sufficient. In certain cases of polypi or other growths in the frontal sinus it will not be sufficient, but it will establish permanent drainage even in these, and with such drainage many of them will recover without further interference.

The essential instruments for my operation are fine steel bent probes, 14.3 centimeters in length by .6 millimeters to 1.5 millimeters in diameter (H to H¹, Figure 1), that are introduced, with the aid of a removable handle, through the nasofrontal duct into the frontal sinus; a perforated or (bead-like) burr (G, Figure 1), that is run in over this probe to make a drainage canal of adequate size, and a spring-gold self-retaining tube (E, Figure 1), to maintain the lumen of this canal until it has become covered with mucous membrane.

A similar tube as large as the canal made by the operation would, I think, be a great help in the subsequent treatment in all of the other practicable intranasal operations. This tube not only prevents closure of the canal, but it is a great help to the patient in washing out the frontal sinus, which can be done every day after the operation by the patient himself. With the eustachian tube catheter that I give the patient for washing out the sinus he can readily locate the metal drainage tube and irrigate the sinus without pain. In order that this operation may be made perfectly clear, I must repeat something of what I wrote a decade ago.

I first attach a silver canula 1.5 millimeters in diameter to a two dram syringe (B, Figure 1) and pass it as far as possible into the nasofrontal duct, the lower orifice of which is immediately behind the uncinate process and external to the anterior end of the middle turbinated body. This canula is ten centimeters long, and in order to allow it to adapt itself to the sometimes tortuous frontal sinus, three centimeters of its distal end is of soft silver. In order to avoid pain and to remove swelling the syringe is charged with ten per cent of cocain in 1/4,000 of epinephrin, and as the canula is introduced about one minim of this solution is forced through it, about every two minutes, three or four times. In the great majority of cases the canula may after a few minutes be carried on into the frontal sinus, but sometimes the enlarged agger cells that occupy the upper part of the uncinate process obstruct the passage, and in other cases the canula passes into a frontoethmoid cell and it is not possible to follow the nasofrontal canal; however, the region has thus been anesthetized and the swelling reduced. Then I try the steel probes and alter the curve as seems indicated by the direction the silver

canula has taken. If in the adult the end of this probe cannot be passed more than 5.2 centimeters from the posterior inner angle of the nostril, I know that it has not gone into the frontal sinus. When it passes into the sinus, the end of a probe bent from thirty to fifty degrees will be six or seven centimeters from the point indicated.

In order to avoid all danger, frontal and lateral skiagrams should be taken with the probe in situ, and thus one may be certain whether or not it is safe to enlarge the canal to a diameter of six millimeters. (Figures 2 and 3.) I have examined a great number of anatomic specimens with this point in view, and have seen only one where the burr could not have been passed with perfect safety. In that one the nasofrontal duct ran so close to the olfactory groove that almost any operation, either internal or external, to establish drainage would have opened into this groove.

In all cases the anterior third of the middle turbinated body should be removed before the operation. This allows more freedom of motion. I have done the operation two or three times without this procedure, but have regretted it, as swelling of this tissue is apt to interfere with free drainage and with irrigation. If possible the frontal sinus should be well washed out before the operation is done. After the safety of the operation has been proven by the skiagram, with the probe in position, the nasofrontal duct and the frontal sinus are anesthetized by injecting into the sinus about a dram of five per cent cocain in 1/4,000 of epinephrin. The whole naris is then thoroughly swabbed with vaselin. The probe, which should be of a length to project four or five millimeters beyond the burr (G, Figure 1) when the latter has been passed over it to the farthest extent, is then introduced and its handle removed. The shank of the burr is then attached to the chuck of the dental engine, and the perforated burr with the spiral metal tube (F, Figure 1) over its shank is slipped over the probe and pressed up to the roof of the naris. The current is then turned on, slight pressure is made, and in a second or two the frontal sinus has been opened.* I usually pass the

*A simple handle may be used instead of the dental engine, and the burr run in by hand, which would require only a little more time in most cases.

burr up and down a couple of times to clear the opening of any obstructing mucous membrane, and then the operation is finished excepting what might be termed the dressing.

In any of these intranasal operations it is very important to caution the patient not to blow the nose, because of the danger of forcing air and septic material into the orbit or subcutaneous cellular tissue.

In this operation there is very little blood, so that the field of operation is not obscured. When there appears to be any danger of injuring the posterior wall of the frontal sinus, a strong thread is fastened to the distal end of the spiral tube (F) and kept from slipping by a narrow strip of adhesive plaster, and when the burr has been passed up to the roof of the naris, strong traction is made on this thread so as to draw it and the burr forward. When this is done, or when the probe has had to be bent more than usual, the enlarged canal has a curve that may not admit the other instruments or the gold tube, therefore, in such cases, as soon as the burr has been withdrawn, I introduce another probe with the normal curve (H^1, Figure 1), and then run the burr in again. I devised a shield to use in such cases, but now think this simple method better.

In cases where the end of the probe has been caught in a frontoethmoid cell or stopped by the upper end of the processus uncinatus, I pass it in as far as practicable and then run in the burr, after which I have never yet found any difficulty in passing the probe into the frontal sinus and completing the operation.

When the burr has been removed I pass in the bent tube packer (D, Figure 1), through which I introduce the end of a yard of a half-inch strip of gauze, about a foot of which has been saturated with a liquid formed by rubbing together equal parts of camphor and carbolic acid. This is a powerful antiseptic but not an escharotic. It is pushed on into the frontal sinus and allowed to remain about five minutes. The packer tube is then drawn down about half an inch so as to expose the raw surface caused by the burr, and the gauze is slowly withdrawn, thus practically searing the raw surface so as to prevent absorption of the pus that will for some time flow down from the frontal sinus, (Figures 4 and 5.)

CASE RECORD.

McF., A. O.—Figures 2, 3, 4 and 5 show the skiagraphs of an unusually difficult case of two months' duration, following a crushing injury of the nose, forehead and chest that had occurred ten months previously. The wounds had mostly healed, leaving great deformity which dislocated the landmarks so that it was difficult to find the orifice of the nasofrontal duct, and which had so changed the direction of the latter as to require an unusually sharp curve in the canula, as shown in Figure 3. This should be compared with the normal curve H^1, Figure 1.

In this case the end of the silver canula was engaged in the opening of the nasofrontal duct and a couple of minims of a ten per cent solution of cocain in 1 to 8,000 of epinephrin were injected three or four times at intervals of about two minutes, which reduced the swelling so that the canula was finally forced into the frontal sinus, as shown in Figure 3. This canula was only one and one-half millimeters in diameter. Circumstances made it necessary to delay the operation two days, and then the nasofrontal duct was so much more swollen that the canula could not be inserted more than eight millimeters, which appeared to be about one-third of the length of the canal.

After as good anesthesia as practicable was secured the steel probe was inserted to the same depth and the burr run in, after which the probe could be inserted into the frontal sinus and the burr was run in the whole distance; but the curve of the canal thus made was so sharp that it had to be reduced by rasping out the anterior portion of the canal with Thompson's instrument. The gold tube was then introduced, but, as shown in Figure 4, it was too long, and the drainage canal was so large that it was not securely held in place. In this instance it was difficult to see the anterior end of the middle turbinated body, which was the only landmark for finding the nasofrontal duct, therefore this was not removed until after the burr had been passed into the frontal sinus.

To prevent bleeding from this latter wound, and at the same time prevent the gold tube from slipping down, the naris was packed with a strip of rubber sponge two and one-half

centimeters wide, six centimeters long, and five or six millimeters thick. This packing is shown by the peculiar cellular appearance in the naris below the tube in Figure 4.

Some days later, when the swelling about the wound to the turbinated body had gone down, the original gold drainage tube was withdrawn and a shorter one inserted (Figure 5).

In cases where I have reason to suspect polypi, granulations or swollen degenerated mucous membrane, a small flexible curette (A, Figure 1) is used carefully before applying the gauze. The vaselin that has been swabbed over the naris protects the mucous membrane from any irritating effects of the antiseptic. As the gauze is used in a single strip, there is no danger of leaving any part of it in the frontal sinus unless it should be torn; however, it would be well to measure it before and afterward.

The spring ends of the gold tube (E, Figure 1) are pressed together by winding an elastic band around them, and slipped into a No. 2 gelatin capsule. The spiral tube (F) is then placed over the applicator (C, Figure 1), and the gold tube is slipped on its distal end. Thus the gold tube is easily introduced, and the spiral tube is pushed up to hold it while the applicator is withdrawn. I then introduce the small steel probe once more, to punch a hole in or push off the gelatin capsule, which will dissolve in three or four minutes. The gold springs at once spread out and hold the drainage tube in position. If one has thought best to enlarge the opening beyond the size of the burr, on account of diseased surrounding cells, the gold tube should be of sufficient size to fill the canal, otherwise it may not remain in place. Latterly, I have dipped the gelatin capsule, after being applied over the gold tube, in paraffin with melting point of 105 to 115 degrees F. before introduction, so that it will not dissolve before I have the drainage tube in position. This paraffin is broken by the expansion of the gold springs and very soon escapes with the secretions. The operation is thus completed. The patient has had the minimum of shock and pain; there has been no loss of blood; all the steps of the operation have been carried out under accurate observation, and the patient is not required to remain in the hospital, for he can wash out the frontal sinus as often as desired, without pain. For this purpose I give the

patient a metal eustachian catheter, bent to the same form as the applicator, which I mark by placing about it a strip of rubber plaster that will come to the nostril at its upper part when the end of the tube is at the orifice of the drainage tube; then the contact of metal on metal will be recognized and the end of the catheter can be easily slipped into the drainage tube. A hand bulb with fixture to fit the flaring end of the eustachian catheter is used to wash out the cavity. The mucous membrane from the frontal sinus, from the naris, and from the islands of mucous membrane opened up in surrounding cells, soon spreads out outside the gold tube and forms a complete mucous covering, thus leaving a canal six millimeters in diameter that cannot close and that approaches as nearly as possible to normal conditions. This is an important factor in preventing reinfection of the sinus when the patient subsequently gets colds in the head.

The drainage tube should be left in three or four months. It gives the patient no inconvenience. This operation in no way militates against a later external operation, if that should be thought necessary; indeed, it is an aid to the external operation, as a large drainage canal has already been made into the naris, and it in no way interferes with subsequent operations on the ethmoid cells.

No operation in this region is free from danger, and the greater the trauma the greater the risk. From my experience I believe this operation is the safest, and that it will prove efficient in nearly all chronic cases, and that patients will recover as quickly as from any of the other operations.

In acute cases it is usually much more difficult to pass the probe, and when this cannot be done the operation is not applicable until some of the anterior ethmoid or the agger cells have been broken down by Mosher's or Watson-Williams procedures.

It should be remembered that the nasal ostium of the drainage canal from the frontal sinus is located just external to the anterior end of the middle turbinated body, and that not infrequently, in both acute and chronic inflammations of the frontal sinus, removal of a part of this turbinal will relieve the obstruction and insure recovery.

In a large percentage of acute cases the application of heat

externally, and especially by the Bruenings headlight bath (Figure 6), frequent applications of appropriate quantities of epinephrin and cocain will reduce the swelling so as to avoid the necessity of any operation.

In acute inflammation of the accessory sinuses we obtain much benefit by the repeated use of heat, which is most conveniently applied by the headlight bath. The patient should be kept in bed and the bath applied from once to four times a day, according to the severity of the symptoms.

The electric bulbs are used to furnish heat, but probably have no other influence.

In using the light bath the eyes are thoroughly protected from the light. The box is placed over the head and the current is turned on and left until the thermometer shows 182 degrees F., which usually requires about fifteen minutes. The current is then turned off, but the bath is continued about fifteen minutes longer until the temperature comes down to that of the surrounding atmosphere.

FIGURE 1.

A, curette; B, silver canula for syringe; C, applicator; D and D[1], packer; E, gold drainage tube—from left to right, first with spring ends covered by gelatine capsule, capsule, lumen of tube when springs are closed, tube with springs expanded and end of tube; F, spiral tube; G, perforated or bead-like burr; H, H, steel directors or probes, of different sizes and bent at different curves; H[1], steel director of normal curve; I, handle for directors or probes.

FIGURE 2.

Radiograph of case here recorded with canula in right frontal sinus. Outlines of right sinus obscured by pus. Left sinus small.

FIGURE 3.

Lateral view, canula in right frontal sinus. These two views show that the burr can be introduced without danger. Note extreme curve of the canula, as compared with normal curve H¹, Figure 1.

FIGURE 4.

Same case shortly after gold drainage tube had been introduced. Note that the tube was too long. The cellular appearance below tube is due to packing of rubber sponge.

FIGURE 5.

Same case with shorter gold tube, which is in correct position.

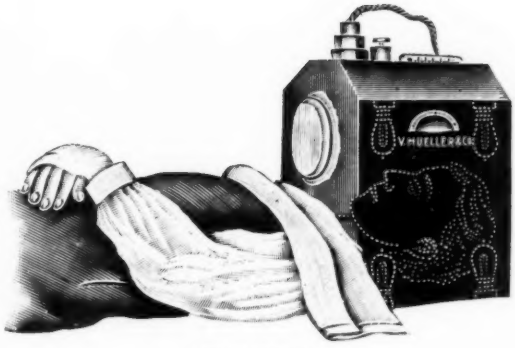

FIGURE 6.

Headlight bath. A thermometer that does not show in this cut records the temperature. The patient breathes the outside air. Connections not shown.

XLII.

PRIMARY DISEASES OF THE LABYRINTH AS THE RESULT OF FOCAL INFECTION.*

By George E. Shambaugh, M. D.,

Chicago.

Accurate knowledge of the diseases of the internal ear has been very difficult to acquire, owing especially to the difficulty surrounding the study of the pathology of the labyrinth. In recent years a great deal has been done to clear up obscure facts relating to the pathology of those changes in the labyrinth which occur secondary to infection in the middle ear. The pathology, also, in cases of long standing nerve deafness, is now well understood. There still remains a great deal of obscurity regarding the pathologic changes in the labyrinth, especially in cases of primary disease of the internal ear. Here we still find it necessary to piece out our knowledge by analogy from similar conditions occurring elsewhere. Fortunately, our increased knowledge of the physiology of the labyrinth enables us now to interpret much more accurately than heretofore the symptoms arising from disease of the internal ear. Our improved methods for making a functional examination, moreover, enable us to detect more readily disturbances in the function of the labyrinth.

The clinical phenomena observed in these cases of primary involvement of the internal ear are quite definite, although the symptoms vary more or less widely in different cases. The defect in the hearing is always quite characteristic. It begins as a defect in the upper part of the tone scale, while the hearing at the lower part of the tone scale remains normal, even after the defect for the higher notes has become quite extensive. In a few cases the loss of hearing does not begin at the

*Read at the meeting of the American Laryngological, Rhinological and Otological Society, Atlantic City.

highest part of the tone scale, but consists of a defect more or less circumscribed in the middle of the tone scale. For example, one may find a defect especially marked for the c^4 fork, while the Galton whistle may be heard normally throughout its entire extent. Paracusis Willisii is never a symptom in these cases, and tinnitus aurium, although often present, is rarely, if ever, the annoying symptom which it so frequently is in cases of otosclerosis. In most of the cases both ears become involved sooner or later, and when both are involved the shortening of bone conduction is always present. In one sided involvement the positive Rinné will be changed to a negative in those cases where the defect in hearing is quite marked.

Symptoms arising from an involvement of the vestibular part of the internal ear constitute a very important part of the clinical phenomena observed in many of these cases. Primary disease of the internal ear constitutes, in fact, the most frequent cause for the symptom of vertigo. An involvement of the vestibular apparatus in these cases is, moreover, much more common than the occurrence of vertigo would indicate, as we have been able to ascertain since the introduction of tests for examining the function of the semicircular canals.

Another important clinical fact that has been brought to light by the introduction of the vestibular tests is that primary degeneration of the vestibular nerve occurs quite independent of a similar process involving the cochlear nerve. In these cases an occasional attack of vertigo is the only symptom indicating disease of the labyrinth.

We see, therefore, three distinct types of primary degeneration in the labyrinth: one where the cochlea alone is involved, producing nerve deafness and more or less tinnitus; the second, where the vestibule is involved simultaneously with the cochlea, producing, as a rule, occasional attacks of vertigo in addition to the symptoms arising from disease of the cochlea; the third type, where the vestibular nerve alone is affected, and where all symptoms indicating disease of the labyrinth may be absent, except for possible occasional attacks of vertigo.

The progress of this disease differs widely in different cases. Not infrequently there appears to be a gradually increasing degeneration of the parts involved. In many cases

progress of the degeneration is accelerated by acute exacerbations. In others an acute attack is apparently followed by a long period of quiescence, when there is no progress in the degeneration—at least none that can be detected by our examinations.

The variations in the symptoms depending on the way in which the disease of the labyrinth progresses is especially striking for those cases where the vestibular part is involved. An insidious degeneration produces no symptoms excepting the gradual development of nerve deafness associated, perhaps, with some tinnitus. Where the degeneration is accelerated by acute exacerbations, this is recognized by an increase in the deafness and the development of a more distinct tinnitus; and where the vestibular part is involved, by the occurrence of distinct attacks of vertigo. The symptoms arising from the vertigo sometimes quite overshadow the other phenomena. When the vertigo is severe enough to cause nausea and vomiting, the cause of the disturbance is often mistaken for some gastric disorder. The actual disturbance produced by the vertigo varies from a slight disturbance of equilibrium to a profound shock, which throws the patient violently to the ground and produces dizziness which does not disappear for several days or even weeks. Where one has an opportunity of examining a case during the attacks of vertigo, he is able to recognize the characteristic vestibular nystagmus.

The question of the diagnosis of labyrinth disease is especially interesting in those cases where the principal symptoms are those resulting from the vertigo, such as nausea and vomiting. Before the introduction of the vestibular tests the diagnosis of a possible labyrinth origin for the vertigo was based on the presence of symptoms of disease of the cochlea—that is, tinnitus and nerve deafness. In those cases where a diagnosis could be made of a degenerative process going on in the cochlea, it seemed fair to assume a probable labyrinth origin for the vertigo, since it is known that primary degeneration in the labyrinth is the most frequent cause for this symptom. It is evident that in those cases where the degenerative process was limited to the vestibular nerve—that is, where the hearing was not affected—the labyrinth origin for the attacks of vertigo would often pass unrecognized. Fifteen years ago I

began compiling a series of such cases where the symptoms complained of were those of vertigo and the disturbance caused by the vertigo, such as nausea and vomiting, but where there was no involvement of the cochlea, and where no other cause for the vertigo could be detected. At that time it was necessary to assume a condition which we could not demonstrate—namely, a primary involvement of the vestibular apparatus, independent of any disease of the cochlea. In recent years, since the introduction of the vestibular tests, I have been able to go over a number of these cases and to demonstrate the loss of function in the semicircular canals.

The etiology of primary degeneration of the labyrinth is quite clear in many cases. It is not infrequently a complication of syphilis, both hereditary and acquired. It is observed also as a sequel of the infectious fevers, especially in mumps, typhoid, measles, and scarlet fever. There remain, however, a large percentage of these cases of primary disease of the internal ear where the etiology has not been accounted for. It is in these cases where I have suggested focal infection as a possible cause. This conclusion was based upon the similarity between the manner in which the labyrinth involvement takes place and the involvement of other nerves where focal infection is known to be the cause. When the involvement of the labyrinth is associated with other evidences of systemic infection of focal origin, such as rheumatism or neuritis, one sees little difficulty in assuming a possible focal origin for the neuritis of the eighth nerve. In cases, moreover, where the degeneration of the eighth nerve develops quite independent of any other manifestation of systemic infection, a possible focal origin should not be overlooked, for it is not an infrequent clinical phenomenon to observe a single nerve the seat of persistent neuritis from focal infection.

I will report here briefly a few cases of primary labyrinth disease where focal infection appears to be the probable cause.

The first case is that of a man, aged twenty-eight years, who consulted me in October, 1914. He had been subject to attacks of acute articular rheumatism since the age of ten, and had some joints which at the time of the examination were acutely involved. Evidence of an old endocarditis was also discovered. There was a history of recurring attacks of ton-

sillitis, and, although the tonsils had been operated, they had been only partially removed. In February, 1917, the patient consulted me because of an attack of vertigo associated with tinnitus. The trouble had begun six days before as a tinnitus in the left ear, which he had noticed first on retiring. He was wakened in the middle of the night because of vertigo and nausea. The severity of the vertigo forced him to remain in bed for twenty-four hours, and at the time when I saw him, six days after the onset, he was still annoyed by the disturbance of equilibrium. He recalled having had previous attacks of tinnitus but not of vertigo. He was still suffering from acute rheumatism in several joints. A careful examination of the hearing failed to detect any defect. There was no spontaneous nystagmus, but the rotation test disclosed a marked depression of function for both the right and left labyrinth. The nystagmus following the rotation to the right was extremely feeble and lasted but twelve seconds, and after rotation to the left was of the same character and lasted eleven seconds.

The second case is that of a man, aged fifty-one years, who consulted me in March, 1914, complaining of defective hearing, which he thought might have been coming on for several years. There was no tinnitus, no paracusis, and no history of deafness in his family. Examination disclosed normal drum membranes. A defect in the hearing for the whispered voice was found in both ears, especially marked for numbers like 66, which was heard only at one foot for either ear. The C fork, 64 d. v., was heard normally for both ears, as was also the c^4. The Galton whistle (Edelmann) was heard at 4 in the right ear and at 19 in the left.

The patient returned to the city again December 10, 1914, when he complained of a high-pitched continuous tinnitus which had developed during an actue head cold one month before. There was a distinct increase in the defect for the Galton whistle, especially in the left ear. The faucial tonsils were somewhat enlarged and distinctly congested. Cheesy plugs were expressed from both tonsils. There was no accessory sinus trouble, and no infection about the teeth. In April, 1915, the patient discovered that he was running a temperature ranging as high as 100° and 101° each day. At one time

it registered 103°. Examination of the blood showed a leucocytosis of 14,000. During this time he developed a severe persistent arthritis in the instep of the left foot, which came on spontaneously and was not the result of traumatism. There were no other rheumatic symptoms. This condition continued without abatement until June, when the tonsils were removed, after which there was a gradual subsidence of the temperature and disappearance of the leucocytosis.

The patient was seen again December 6, 1916, complaining of increasing annoyance from the tinnitus in the left ear and from beginning tinnitus in the right. His general condition at this time was good, and the arthritis had practically disappeared. The functional examination of the ears was carefully gone over. There was a distinct shortening of bone conduction, and the Rinné was positive in both ears. The Galton whistle was heard at 6 in the right and 25 in the left ear. There had been at no time any symptom of vertigo, yet the nystagmus after rotation to the right lasted but nine seconds, and after rotation to the left but six seconds, and was very weak. The past-pointing after rotation to both the right and left was still present, but very slight.

In this case the chief symptom was the insidious development of nerve deafness, which became quite extensive in the left ear. Tinnitus developed after an acute infection only after the condition had been present several years. At no time was there any vertigo, yet the examination disclosed a very marked degeneration of the vestibular nerve in each ear. The patient's general condition remained good except for a period of several months in 1915, when he was running a temperature. There was no history of syphilis, and the Wassermann test was entirely negative. The patient has suffered from no infectious fever, but he did suffer from distinct evidence of a systemic infection, as shown by the protracted rise in temperature, the leucocytosis and the arthritis. It seems logical to assume that the same cause was responsible for the degenerative neuritis which involved both branches of the eighth nerve.

A third case is one where the neuritis of the eighth nerve followed distinctly from an attack of acute tonsillitis. The case is briefly as follows: Mrs. H., aged thirty-four years,

consulted me May 15, 1917, especially because of vertigo and deafness. She gave the following history of the onset of her trouble: Two weeks ago she contracted a severe tonsillitis on the left side, which developed with white patches. No cultures appear to have been made. She suffered from severe headache for three or four days. During this time she developed facial paralysis on the left side and huskiness of the voice, which examination showed was due to paralysis of the left vocal cord. At the same time she began to suffer from slight tinnitus in the left ear, which resembled the noise of a sea shell and was associated with a defect in the hearing and intense vertigo, with nausea and vomiting.

When she consulted me I found the facial paralysis was still practically complete on the left side, and the left vocal cord was immovable. Drum membranes were quite normal. Transillumination of the mastoid showed normal condition both sides. Functional examination showed the hearing in the right ear to be entirely normal. In the left ear the whispered voice was heard only close to the ear, and it might easily have been perceived by the opposite ear. The hearing for the C fork 64 d. v., was only slightly shortened in the left ear. The Weber was lateralized to the right. The Rinné test was positive in both ears. The hearing for the c^4 fork was only slightly shortened in the left ear, while the hearing for the Galton whistle was but slightly shortened at the upper limit. A striking peculiarity in the hearing of the left ear for all the tuning forks was that they were heard distinctly at least an octave higher in the left ear than in the right, and this applied to the Galton whistle as well. The Romberg was positive, the patient falling to the left. There was a spontaneous rotatory nystagmus, which still persisted especially strong on turning the eyes toward the left, but disappeared entirely on looking to the right. Spontaneous pointing showed slight deviation to the left. Nystagmus after rotation to the right was very weak and lasted but seven seconds; to the left was quite strong, but disappeared in about twenty seconds. Caloric stimulation produced no response in the left ear, but normal response in the right ear.

Diagnosis.—Peripheral toxic neuritis, as the result of tonsil infection involving the eighth nerve, the seventh nerve, and

responsible for paralysis of the left vocal cord. The case was examined carefully by Dr. Thor Rothstein, a neurologist, who arrived at the same conclusion.

The last case to which I will refer was a Mrs. K., aged sixty-one years, who consulted me in May, 1917, because of roaring tinnitus aurium, deafness and attacks of vertigo, which developed suddenly January last. She has had a number of attacks in which the vertigo is associated with nausea and vomiting. The patient has been subject to recurring tonsillitis for many years. The tonsils were found to be enlarged, congested, crypts filled with cheesy deposits—in other words, the seat of a chronic infection.

In the functional examination the whispered voice was heard normally in the right ear; in the left ear there was a distinct shortening for 66, but not for 18. Weber was not lateralized. Schwabach test showed distinct shortening of bone conduction. The Rinné was positive in both ears. The C fork, 64 d. v., was heard normally in the right ear and only slightly shortened in the left. The same was true for the c^4 fork. The Galton whistle showed a distinct defect at the upper end of the tone scale, involving both ears. Examination of the vestibular apparatus showed spontaneous pointing normal. There was no spontaneous nystagmus when the patient was examined. Rotating the patient to the right developed a nystagmus which was very strong with rapid movements and lasted thirty-two seconds. Rotation to the left developed a nystagmus which was very weak and lasted only sixteen seconds. In this case there is apparently a neuritis involving both sides, but with the cochlear nerve more involved on the left side and the vestibular nerve more involved on the right.

XLIII.

THE STATIC LABYRINTH IN SYPHILIS.*

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Syphilis, excepting tuberculosis, is perhaps the most prevalent disease with which we as physicians have to deal. Its frequency is startling, its manifestations are legion, and no organ or tissue, from intrauterine life to the grave, is free from the liability of its attack. The discovery and demonstration of the spirocheta pallida, and the Wassermann reaction in the blood and the cerebrospinal fluid, have conclusively proven the syphilitic nature of many diseases which we have heretofore considered and studied as clinical entities; therefore, though we may retain certain names for the sake of classification, we must accept the fact, as one author has stated it, "that these diseases are syphilitis, and always syphilitic."

We know that syphilis of the cerebrospinal system may simulate any disease of the brain and spinal cord substance, their vascular supply and their coverings, and it is only by the examination of the blood or the spinal fluid that we can definitely determine whether or not a central nervous system lesion is syphilitic in origin. A vast amount of laboratory work along this line has shown that brain syphilis is by no means always a late manifestation of the infection, and thereby it has become possible to diagnose lues of the central nervous system long before the appearance of the classic objective signs that we are used to consider as pathognomonic, such as the Argyl-Robertson pupils, the diminished as abolished tendon reflexes, areas of increased sensibility, etc.†

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†Wile and Stokes: Involvement of Nervous System During the Primary Stage of Syphilis. Journal A. M. A., March 20, 1915, p. 979. Six cases of early syphilis with involvement of nervous system in four.

Collins: Brain Syphilis. Journal A. M. A., July 10, 1915, p. 139 (Vol. LXV, No. 2).

Such signs in fact belong to a later stage of the infection, and indicate that an irreparable destruction of the parenchymatous cells has already taken place; whereas in the early stage of an invasion, it is vascular structures and the meninges which are involved, and though it does not necessarily follow that a basilar meningitis of syphilitic etiology must lead to an involvement of the brain or cord substance, there is always this possibility, which undoubtedly may be the better averted the sooner appropriate treatment is instituted.

The subject of brain syphilis is of prime importance to the otologist, for the reason that the preponderance of evidence in many investigations goes to show that the eighth nerve is more often affected in all stages of syphilis than any other of the cranial nerves; that the lesion is probably a true neuritis of the eighth, its nuclei, its trunk, or its peripheral distributions; and that its involvement is indicative of the luetic invasion of the central nervous system.

For many years we have recognized that certain forms of deafness were due to hereditary syphilis. The first contribution to the subject was probably published by Feichtman[1] in 1857, though the classic paper of Hutchison and Jackson[2] may be considered the pioneer work, especially as these authors correctly defined the nerve deafness which is characteristic.*

It is not only in hereditary syphilis, however, that the auditory nervous mechanism may become involved. Habermann[3] in 1896 reported sixty-six cases of syphilis of the internal ear, of which thirty-four were attacked during the secondaries. Mayer[4] in 1911 reported sixty-five cases of syphilitic internal ear disease, thirty within the first year of the infection, thirteen within from three to ten weeks following the primary sore. Politzer[5] reported one case occurring seven days after the chancre. All these cases, and many more by various authors, were reported before the advent of salvarsan, to the use of which so many cases of deafness has been accredited. It is far from the purpose of this paper to reopen that controversy, for it is now pertty well understood that insufficient

*C. Ernest West has given a complete historical review of the subject in his chapter "Aural Syphilis" in the monumental "System of Syphilis" edited by D'Arcy Powers and J. K. Murphy.

treatment with the arsenical preparation may do harm, although the extent of this has undoubtedly been exaggerated. In 1915 W. W. Willcut[6] presented, before the American Medical Association, a report of two hundred and ninety-three syphilitics examined by him in Urbantschitch's Clinic. None had had salvarsan. In fifty-six cases of a month's duration or less he found fifty-two showing the characteristic deafness of syphilis. All had negative Wassermann reactions, but the diagnosis was certified by the demonstration of the spirocheta pallida in the primary sore. G. P. Wintermute[7] reported three cases of acute syphilitic acoustic neuritis before the same session of the American Medical Association (San Francisco, 1915), and gave complete and valuable data concerning the symptoms, course and treatment of these conditions. The cases studied, both by Willcut and Wintermute, are most conclusive, and the bibliographies furnished by these authors are very complete. Evidence is surely not lacking that the eighth nerve is often affected in primary syphilis, nor is proof wanting that it is also often involved in the late syphilides, and that aural symptoms may be one of the first signs in tabes dorsalis and general paresis. Ellis and Swift[8] found deafness of the nerve type in forty per cent of a series of tabetic cases. Shaller[9] found the internal ear involved in sixteen cases out of thirty-five patients with early tabes. Deafness is now mentioned by all neurologists as one of the symptoms often found in the preataxic stage of tabes dorsalis.

Naturally, there have been many different views respecting the portion of the ear and of the nervous apparatus of the ear that is affected in syphilis. Sexton[10] attempted to show that the deafness in syphilis was due to lesions in the middle ear, but this contention was completely refuted by St. John Roosa.[11] Moos[12] in 1887 found changes in the vestibule, in the organ of Corti, and in the ampullæ of the semicircular canals, but a normal nerve trunk, in a patient with secondary syphilis who had died soon after ear symptoms had arisen; and thus the trend of opinion from then on was to consider the ear lesions of the secondaries as intralabyrinthine.

Deafness occurring in tertiary syphilis was studied by Rosenstein,[13] who found lesions in the nerve stem, in the nuclei, in the roots, and in one case in the roots alone (Ellis

and Swift[8]). Mannasse[14] has given a most complete picture of the morbid anatomy found in a patient with tertiary syphilis who had been deaf for one year before death. He found changes in the nervous structures of the cochlea, of the semicircular canals, and also in the nerve trunk. In tabes with deafness Habermann[15] found gray atrophy of both auditory nerves, and atrophy of the nerve endings in the cochlea and in the semicircular canals. The nuclei were intact, the lateral and median acoustic roots much atrophied. Bruehl[16] found degeneration in the nuclear region of the eighth nerve. Mayer[17] studied five cases of general paresis with deafness, and found atrophic changes in all the nervous elements of the ear from the organ of Corti to the medulla. Rosenstein[18] believes that deafness in inherited lues is due, in many instances, to a basal meningitis, though other observers place the lesion within the labyrinth. In 1912, Knick and Zaloziecki[19] examined the spinal fluid in nine cases of early syphilis with deafness, and found a high cell count in all nine and a positive spinal fluid Wassermann in eight. They claimed, therefore, that the deafness in early syphilis is due to a syphilitic meningitis which involves the eighth nerve.

Ellis and Swift[8] corroborated this work in seven cases of their own, and concluded "that all lesions of the eighth nerve are possible manifestations of a disastrous form of a general infection—syphilis of the central nervous system." Willcut[6] believes that the involvement of the cranial nerves in early syphilis is due to a toxic irritation of the nerve sheath and the peripheral end organs. He mentions the eighth, the first and the seventh nerves, and says: "The acoustic, for some unexplainable reason, appears to be the most sensitive of all the cranial nerves." Willcut and many authors seem to overlook the anatomic peculiarity of the eighth nerve being devoid of neurilemma; it is, therefore, all the more liable, on account of its position, to become inflamed during the course of a basal meningitis or from toxic substances circulating in the cerebrospinal fluid. It is hardly possible to doubt the observations of any of the authors quoted, consequently, though we must accept the conclusions that the lesion is to be found in the nerve tissue, we must also accept the fact that the eighth nerve may be attacked centrally, axially or peripherally;

therefore, the careful clinical study of this particular class of patients by the newer and more accurate methods of otologic examination should put us well on the way to that precision in diagnosis which Robert Bing says is wanting—namely, the differentiation between lesions of nerve or its supranuclear tracts and lesions of the percipient structures in the internal ear. It is possible to separately examine both the cochlea branch and the vestibular branch of the eighth nerve, and in the latter tests the phenomenal work of Bárány has been so amplified by the methods and teachings of Randall, Jones, Fisher, Brumm, and others of the "Philadelphia School," that localization of eighth nerve lesions has certainly passed beyond the stage of hypothesis.

It is generally taught that if the cochlea division of the eighth nerve is found to be normal, the socalled static labyrinth and the vestibular nerve will also be normal. In syphilis, however, it is possible for the vestibular branch to become involved at some point along its course, while the cochlea branch may remain normal. That the reverse may be true is admitted by all. In a large percentage of syphilitic cases both divisions of the eighth nerve will be affected and, therefore, both the auditory and the static labyrinth should be tested. It should be remembered that patients with the acoustic neuritis of syphilis may hear the voice surprisingly well and may not complain of deafness until questioned; the tuning forks, therefore, offer the best means of correct diagnosis in these cases.

The typical hearing defect is a shortening of the duration of perception by bone conduction, out of all proportion to the shortening of the duration of perception for the same fork by air conduction; the retention of good hearing for the low forks, with a loss of perception, or a reduction in duration of perception, for sounds of high pitch. All tuning fork tests should be made under the correct law of decrement of the vibrations (Dundas Grant[19]); therefore, we should attempt to determine the shortening in the duration of perception as compared to the normal, and not simply the duration of perception itself.

The Schwabach test is best made with the opposite ear excluded by a "noise apparatus" regulated to that intensity

which is just sufficient to prevent contraaudition. If the Rinné is made by separate tests of bone and air conduction, it is not infrequent to find that bone conduction is actually reduced out of all proportion to the reduction of perception by air conduction, as physically impossible as this may seem, and such a reaction is indicative of an acoustic neuritis rather than of an intralabyrinthine lesion. I have found the C^5 (4096 d. v. s.) fork of more use in routine work than the Galton whistle, for the reason that the intensity is so great with the latter instrument that partial defects in high register are difficult to determine.

No matter with what care we may attempt to determine reductions in audition, we must always depend upon purely subjective methods. The tests of the vestibular apparatus are to a large degree objective, and in normal individuals the reactions are surprisingly constant, when the tests are made with precision and with due regard to details. In the rotary tests the after-nystagmus should last for twenty-six seconds, the patient having been turned ten times in twenty seconds. The vertigo should last under the same conditions for twenty-four seconds. Nystagmus should be induced in forty seconds by douching the ear with water at 68° F. These are the normal responses found by I. H. Jones, who has further simplified the interpretation of the reactions by giving us the very easy rule to remember, that the nystagmus, the falling and the past-pointing, are all in the direction of the endolymph flow, with the vertigo in the opposite direction. Dr. Jones and his associates further teach that each semicircular canal has a separate nystagmic and vertiginous tract. They have been able to locate approximately, and to postulate, the situation of these pathways in the brain stem, the cerebellum and the cerebrum; hence, their methods of localization in the eighth nerve lesions, and in intracranial conditions involving the eighth nerve, are the most accurate that we have.

In the last eighteen months I have had the opportunity of making an ear examination of a creditable number of patients with syphilis and syphilitic central nervous system lesions. A number of cases have been examined in the neurologic clinic of the Mercy Hospital, and I am greatly indebted to the neurolgoist-in-charge, Dr. A. C. Gillis, for his cooperation. Many

of these patients did not complain of ear symptoms, though it was not difficult to demonstrate an associated aural involvement. A number presented predominant internal ear disturbances, and in a few instances the examination of the ear led to the diagnosis of serious diseases of the central nervous system. Though the auditory function was disturbed in most of the cases, the tests of the static apparatus, made by rotation and cold douching, were of far greater value in absolutely confirming the presence of a lesion in the nervous structures of the ear than were the tests of audition.

Generally speaking, the abnormal response of the static labyrinth in syphilis may indicate a lesion of the vestibular nerve at any point from its nuclei to its peripheral distributions. If we may have "islands of deafness," we likewise may have islands of static inhibition; if these defects are situated neuraxially, the reactions from the vestibular tests may simulate those seen in brain stem, cerebellar or cerebellopontine tumors. As a rule, however, the syphilitic responses indicate involvement of the eighth nerve trunk or its peripheral distributions, and the neuraxial symptoms are likely to be so atypical that they indicate lesion of such widely separated areas that simultaneous involvement of these tracts by a new growth would be impossible, whereas a degeneration of these different pathways is not at all improbable. The most characteristic reaction of syphilitic internal ear disease is a lowering and confusion of all the responses; this may vary from the totally dead labyrinth, giving no responses, to the cases showing all the normal reactions reduced in degree. For example, the nystagmus will last but ten to fifteen seconds or less, and will show fine oscillations in which the slow and quick components cannot be easily differentiated. Vertigo is absent, or it lasts but a few seconds. Falling is not definite. The patient, if tested quickly after rotation, will past-point with one arm and not with the other, or will only past-point for a few inches, or will past-point incorrectly. The responses may be intensified by increasing the stimulation; thus, nystagmus may be absent after ten turns in twenty seconds, to become evident for some seconds after ten turns in ten seconds. Douching with water at 68° F. will bring on the same reduced or confusing reactions after a much longer period than the normal forty seconds, or it may require

much colder water to bring out any response. Furthermore, it is apparently possible in these cases for one semicircular canal of the same ear to be more affected than the others; hence, we may get all normal responses from rotation with the head in the upright position (horizontal canals), and no reactions with the head forward (vertical canals), or vice versa. Such a lesion would have to exist in the crista ampullaris of one canal only, or as a partial degeneration in the nerve trunk itself, before the nystagmic and vertiginous tracts separate.

Increased irritability of the static labyrinth, evidenced by prolonged nystagmus, with marked vertigo and nausea, is a sign which may not be overlooked. Crossed past-pointing, right arm to the left, and left arm to the right, after turning to the right, and vice versa, has been noted, as has complete reversal of the past-pointing, both arms to the left, after turning to the right, and both arms to right after left turning. Variations from time to time in all the responses must be expected, and may be of value in following the progress of retrogression of the syphilitic process. The reactions, in most instances, point to the ear which is the more involved, and as a rule both are implicated.

I have been able to study twenty-eight patients in whom the diagnosis of syphilis has been positively established, and though the number is far too small to be of statistic value, the clinical data obtained has indicated the general signs just enumerated. Certain groupings of these cases, and individual histories, are not without interest. The histories are arranged in two series: first, those patients in whom ear disturbances were the complaints for which the patient sought relief; second, those patients with central nervous system diseases upon whom a routine ear examination was made, irrespective of aural symptoms. For the sake of brevity, a synopsis of the salient features are given, and details are reported in full only when they have seemed essential.

There are twelve patients in the first group, who came complaining of deafness, tinnitus and vertigo, the frequency of the complaints being in the order named. Deafness and tinnitus were usually both present, but vertigo was not voluntarily mentioned, though histories of slight attacks were elicited in

five cases. A shortening of ten seconds or more in the duration of perception by bone conduction for the C^2 (512 d. v. s.) tuning fork was the basis for further examination of the internal ear, and in every patient under discussion, both the cochlea and the vestibular functions were found to be impaired. Five of these patients were the victims of hereditary syphilis, four of whom had interstitial keratitis. These five cases show practically all the variations of syphilitic eighth nerve involvement.

Case 1.—Marie P., colored, aged nine years. Admitted December 6, 1916. Hereditary syphilis. Interstitial keratitis in active stage. Positive blood Wassermann. Sudden and practically complete nerve deafness of both ears, of three weeks' duration. Both static labyrinths without response in any particular or from any test. No improvement under vigorous mercurial treatment. When the patient was first seen there was a slight amount of hearing present; this has now been destroyed. The child enjoys being literally whirled in the chair, in any position, and can immediately stand erect without a tremor.

Case 2.—Sydney D., white, aged seventeen years. Hereditary syphilis. Incomplete nerve deafness of three years' duration. Positive blood Wassermann. Static labyrinths markedly affected on both sides, though the right ear is the deafer of the two.

Right turning (head upright): Nystagmus for ten seconds. Vertigo for twenty-five seconds. Past-pointing negative in both arms.

Left turning (head upright): Nystagmus negative. Vertigo for ten seconds. Past-pointing of right arm negative. Left arm to right a few inches.

Both ears negative to cold douching in all positions.

Case 3.—Edith L., white, aged sixteen years. Hereditary syphilis. Incomplete nerve deafness of the luetic type, more marked in right ear. Static labyrinths involved. Blood Wassermann positive.

Right turning (head upright): Nystagmus for twenty-five seconds. Vertigo present, but patient complained more of nausea. Past-pointed with right arm correctly to right. Left arm negative.

Left turning (head upright): Nystagmus for fifteen seconds. Vertigo slight. Both arms failed to past-point.

With the cold caloric, nystagmus could be induced from both the horizontal and the vertical canals of both ears. Nausea more marked than vertigo. Past-pointing all negative, except that left ear stimulation of both the horizontal and the vertical canals caused the left arm to past-point correctly.

Case 4.—Mary B., white, aged seventeen years. Admitted July 11, 1916, complaining of deafness of eighteen months' duration, more marked in right ear. Hearing tests showed incomplete nerve deafness of luetic type.

Right turning (head upright): Nystagmus for eight seconds. Vertigo negative. Past-pointing with right and left arm, three inches to right.

Left turning (head upright): Nystagmus for three seconds. Vertigo negative. Past-pointing with right arm negative; with left arm, three inches to right.

The girl has a brother totally deaf from measles (?). Her teeth are Hutchison in type. Her blood Wassermann was positive.

Case 5.—John M., white, aged ten years. Interstitial keratitis in subacute stage. Deafness complained of. Impossible to make satisfactory hearing tests. Right turning gave nystagmus for fifteen seconds. Left turning did not arouse nystagmus. Blood Wassermann positive. Although the tests are incomplete in this case, there is sufficient evidence to show that the cochlea and the static functions are both disturbed.

In cases 2, 3, 4 and 5, the hearing is not markedly impaired. All these people can hear the conversational voice without much difficulty. The vestibular tests have been of far more value in correctly determining the nervous character of the aural disturbances than have been the tests of the audition.

The other seven cases in this group were patients with acquired lues, from whom it was impossible to obtain a history of the primary lesion, except in two instances. The value of the ear tests in this particular may be demonstrated by the citation of one case.

Case 6.—Katherine H., white, aged seventeen years. Admitted August 1, 1916, complaining of deafness of the right ear, which had started July 6th. The hearing tests were very un-

certain, but the duration of perception by bone conduction for the C^2 fork seemed shortened about thirteen seconds in the right ear, and ten seconds in the left.

Right turning (head upright): Nystagmus for twenty-two seconds. Vertigo very slight. Right arm past-pointed to left. Left arm did not past-point.

Left turning (head upright): Nystagmus for seven seconds. Vertigo negative. Right arm did not past-point. Left arm past-pointed to right.

The caloric tests and turning with the head in various positions gave confusing, conflicting and abnormal responses. No history could be obtained from the patient. Her blood Wassermann, however, was positive; and her hearing rapidly improved under antisyphilitic treatment.

The next two cases are of interest from the valuable indication given by the ear examination of serious central nervous system involvement.

Case 7.—Deafness. Optic atrophy. Argyl-Robertson pupils. Negative blood Wassermann. Positive spinal fluid Wassermann. Tabes dorsalis.

Louis S., white, aged forty-four years. Admitted June 12, 1916, complaining of deafness, more marked in the left ear. The duration of perception by bone conduction for the C^2 fork was minus twenty-five seconds; duration of perception by air conduction, minus fifteen seconds. The duration of perception by air conduction for the C fork was minus ten seconds; for the C^5 fork, minus five seconds. The right ear showed a slight reduction in the bone conduction. The patient said that his eyes were also bad, and ophthalmoscopic examination disclosed a beginning primary optic atrophy, more marked in the left eye. Vision right eye, 18/20; left eye, 18/49. Pupils unequal, irregular and sluggish to light. Patellar reflexes absent. The man admitted a primary lesion occurring twenty-five years ago.

Right turning (head upright): Nystagmus for twenty-five seconds. Vertigo and nausea. Right arm did not past-point. Left arm past-pointed to right.

Left turning (head upright): Nystagmus for twenty-five seconds. Vertigo and nausea. Right arm did not past-point. Left arm past-pointed to right.

The diagnosis of tabes was simple enough in this case, and, of course, was not dependent upon the ear examination. After intravenous and intraspinous treatment with neosalvarsan, the eye condition improved slightly, and the responses of the static labyrinth became perfectly normal. Unfortunately, we were only able to follow this case for six months when he disappeared from the clinic, and so far we have not been able to locate him.

Case 8.—Nerve deafness. Marked increase in the duration of the after-nystagmus with nausea and vomiting. Negative blood Wassermann. Strongly positive spinal fluid Wassermann. Tabes dorsalis.

Ella R., colored, aged thirty-eight years. Admitted July, 1916, complaining of deafness of the right ear of four years' duration, of the left ear of a few months' duration. The bone conduction of the right ear for the C^2 fork was negative; the air conduction, minus twenty-five seconds. The C fork was shortened twenty seconds in duration of perception, the C^5 fork could not be heard. The left ear showed bone conduction, C^2 fork, minus twenty seconds; air conduction for the same fork, minus thirteen seconds. The C fork was but slightly shortened, the C^5 fork was normally heard.

Right turning (head upright): Nystagmus for fifty seconds. Vertigo, nausea and vomiting. Past-pointing normally to right with both arms.

Left turning (head upright): Nystagmus for forty-five seconds. Vertigo, nausea and vomiting. Past-pointing normally

The cold caloric brought on the same severe reactions from both ears in all positions of the head. The blood Wassermann was negative.

The woman was put on mercury for a week, and at the end of that time the Wassermann was again negative. She drifted away from the clinic to return in January, 1917, complaining that her hearing was worse, and that she had headache and "stomach pain." Her pupils were now small and sluggish to light, while before they had been normal, and she was strongly urged to have a spinal puncture, but refused. On May 10, 1917, she consented to the examination, and the spinal fluid examination was as follows: Cell count, thirty-one per cubic

centimeter. Wassermann strongly positive. Ross Jones and Pandy, positive. Diagnosis, tabes dorsalis.

The four remaining cases in this group are not without interest, but they shall have to be dismissed with mention only. All had an acoustic neuritis of syphilitic origin, with involvement of the static functions.

From the work done at the Mercy Hospital I have selected sixteen cases for study, which may be grouped under the heads of the neurologic diagnosis of cerebral syphilis, tabes dorsalis, and general paresis.

Seven of these patients may be classified as cases of early brain lesions, six of whom came to the hospital with the complaint of severe attacks of vertigo, and the examination of the ear showed the static labyrinth to be definitely involved in five out of six. The patient who did not complain of vertigo had had an involvement of the ninth, tenth and twelfth cranial nerves. His static labyrinths were apparently normal; the tests, however, were not as complete as I should like them to have been, and he did show a definite "island of tone deafness" for the C^3, C^4 and the C^5 forks, although he heard the upper range of the Galton whistle.

One patient was seen the day following a severe attack of vertigo. Certain details of her history are of interest.

Case 9.—Annie M., colored, aged twenty-nine years. Admitted March 1, 1917, complaining of severe headache and vertigo. The night before, she had fallen and had to be carried to bed. She gave a definite history of lues, the primary lesion having occurred in 1910. Examination showed a positive Romberg. Tenderness on palpation over skull. Neurologic diagnosis, syphilitic meningitis. Her ear drums were normal; her hearing tests showed a reduction in the perception by bone conduction of twenty seconds in both ears. All other tuning fork tests apparently normal.

Right turning (head upright): Nystagmus for twenty-three seconds. Vertigo for fifteen seconds. Past-pointing negative with both arms.

Left turning (head upright): Nystagmus for twenty-one seconds. Vertigo uncertain. Past-pointing negative with both arms.

Two days later, right turning gave nystagmus for twenty-

one seconds; left turning, nystagmus for twelve seconds. One week later (March 28, 1917), with the patient much improved generally, right turning, nystagmus twenty-two seconds; left turning, nystagmus, fifteen seconds. The patient felt so much better that she did not return to the clinic and could not be located. It would seem, from this case, that the vestibular tests offer a most accurate means of following a process of this kind.

I can only touch upon the findings in the other patients of this group, as anything less than complete histories would be of little value. The presence of a positive Romberg in these patients is suggestive of the aural nature of this sign.

Case 10.—Wm. G. M., white, aged twenty-five years. Admitted July 27, 1916, complaining of severe vertigo of three weeks' duration. Romberg positive. Neurologic symptoms pointing to a cerebellar tumor. Spontaneous vertical nystagmus on looking up. Hearing normal. Vestibular tests indicative of a neuraxial lesion, but exceedingly variable and changing from day to day. The patient denied lues, and his blood was negative to the Wassermann test on two occasions. The spinal fluid showed cell count, forty-two; Wassermann inconclusive; globulin test positive. On August 30, 1916, the patient became suddenly and completely deaf in the right ear. He died September, 1916, and the postmortem examination showed an old syphilitic meningitis with a degenerated gumma in the middle lobe of the cerebellum, extending to both lateral lobes, particularly of the right side, and involving the region of Deiters' nucleus.

Case 11.—Chas. L., white, aged forty-seven years. Admitted August 10, 1916, complaining of sudden and complete deafness of both ears and of severe vertigo of ten days' duration. Romberg positive. Neurologic symptoms indicative of a lesion in the region of the corpora quadrigemina. Spontaneous nystagmus to right. Vestibular tests indicative of a neuraxial lesion, though the responses were uncertain and not of great localizing value. Blood and spinal fluid showed strongly marked positive Wassermann. The man left the hospital, but died in a few weeks. No postmortem obtained.

Case 12.—M. M., white, aged thirty-five years. Admitted July 6, 1916, complaining of vertigo and deafness. Typical acoustic neuritic defect in hearing. Nystagmus endured for

forty-five and thirty-five seconds with the head upright, and vertigo and past-pointing were normal. With the head forward, right turning elicited neither nystagmus, vertigo nor past-pointing. On left turning the reactions came, though normally. Positive blood Wassermann.

Case 13.—Louis M., white, aged forty-two years. Admitted November 10, 1916, complaining of vertigo, deafness and tinnitus. Romberg positive. Vestibular tests showed reduced nystagmus from both ears, and no vertigo or past-pointing. Hearing defect of luetic type. Primary lesion in 1913. Positive Wassermann.

Seven cases of tabes dorsalis in various stages have been studied. In four of these both the cochlea and the vestibular branches of the eighth nerve were involved. The cochlea branch alone in one, the vestibular branch alone in two. These patients were not markedly deaf; indeed, a history of hardness of hearing could only be obtained in three of the cases. Four of these patients had primary optic atrophy. Generally speaking, the aural defects were not of wide extent, but they were none the less striking.

Case 14.—Ethel W., colored, aged thirty-five years, with tabes and optic atrophy, showed normal nystagmus in both directions, but on right turning the right arm past-pointed correctly to the right, while the left arm past-pointed to the left. On left turning she past-pointed with the right arm to the right, and with the left arm to the left. This past-pointing error was present in all positions of the head.

Case 15.—Harry T., white, aged thirty-six years, with tabes and optic atrophy, showed nystagmus lasting for twenty seconds in both directions, but on right turning he past-pointed with the right arm to the right, and with the left arm to the left. On left turning the past-pointing of both arms was correctly to the left. The error of the left arm on right turning was present in all positions of the head.

Case 16.—Columbus A., colored, aged fifty years, has been under observation by Dr. Gillis for several years. He presents a cerebellar type of tabes dorsalis with a positive Romberg. His hearing is normal. He has a spontaneous nystagmus, vertical in type, on looking up, and he shows but one abnormal vestibular response—viz., a failure in past-pointing corresponding to a brain stem lesion.

One case of general paresis showed complete reversal of the past-pointing.

Case 17.—Minnie S., white, aged thirty-eight years. Neurologic diagnosis: General paresis. Positive Wassermann in spinal fluid. Hearing normal. Romberg suggestive.

Right turning (head upright): Nystagmus very fine in type, apparently lasting for twenty seconds. Both right and left arms past-point to the left.

Left turning (head upright): Nystagmus the same as in right turning. Both arms past-point to the right.

The error in past-pointing is present in all positions of the head.

Finally, I must beg indulgence for a work of such magnitude from which, as yet, I feel incapable of drawing any but the most general conclusions. Syphilis, as a cause of internal ear diseases, is a factor which may not be considered lightly, or as a rarity; and as the static mechanism, as well as the auditory apparatus is often involved, we as otologists have, in the vestibular tests, a means by which an early perversion of the eighth nerve function may be detected. There probably are no pathognomonic vestibular responses in syphilis, but the very confusing and conflicting reactions are in themselves indicative of multiple lesions, a characteristic of any syphilitic invasion. If syphilitic neuritis of the eighth nerve always points to an involvement of the central nervous system, and in one sense this must be true, then, in all justice to the patients, they should command the combined knowledge of the neurologist, the syphilographer, and the otologist, for Ellis and Swift have shown that the prognosis need not be so grave if treatment is instituted in time.

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XLIV.

SERIAL FROZEN SECTIONS OF THE THORAX FROM A CASE OF ANEURISM OF THE AORTIC ARCH.*

BY

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Twenty, or possibly even ten, years ago there would have been little or no justification for presenting this paper before such a gathering as the present one. However, the gradual extension of laryngologic activities into the regions adjacent to the nose and throat have so widened our field of interest that we feel that no apology is called for in presenting this case to you. So frequently do men in our special line of work introduce instruments into the thorax, and so well is the normal anatomy of this region known, that it occurred to us that a graphic presentation of a case in which the usual relations are badly distorted by disease might be of interest and profit.

We will present first a very brief abstract of the patient's history. (The full history of this case can be found in the Transactions of the Association of American Physicians for 1917.)

He was in the Pennsylvania Hospital twice, once in the service of Dr. J. Norman Henry, and once in the service of Dr. Arthur Newlin.

W. F., negro, aged fifty years, stevedore by occupation. Fifteen years previous to his death he had had a double infection, Neisserian and luetic. Two years before his death

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he noticed a bulging in the upper sternal region, which gradually increased. He had had treatment at various times, including injections of salvarsan, which gave him considerable relief, but in spite of this he continued to grow worse, suffering from paroxysms of coughing and choking of sufficient severity to keep him awake. His main symptoms were dyspnea and pain in the chest and upper extremities. Later in the course of the disease insomnia was marked. He spent most of his terminal time in bed leaning forward, resting his head and elbows on his knees, and during his last days he was kept more or less constantly under the influence of large doses of morphin.

Six days before his death 660 cubic centimeters of clear amber fluid were withdrawn from his left pleural cavity. For the last two months of his life there was a softened area at the apex of the aneurismal protrusion from which a thin sanguineous fluid constantly exuded.

Finally one morning he was seized with a violent hemorrhage from the mouth and nose and expired in two or three minutes. Death was believed to have been due to rupture of the aneurism into a bronchus.

After death his body was secured and brought to the laboratory of anatomy of the University of Pennsylvania. Instead of performing an ordinary autopsy, permission was obtained to do what he wished, and we therefore had the body injected with formaldehyd solution and frozen. Then the thorax was isolated from the head and neck, arms and lower abdomen, and cut into serial sagittal sections about two inches thick.

Figure 1 is a photograph of the patient taken shortly before his death. It shows clearly not only the aneurism itself, but also the eroded area through which bloody serum was constantly seeping.

Figure 2 is a section, viewed from the left, cut approximately through the middle of the clavicle. It shows nothing of the aneurism itself, but a number of the pressure effects of the latter. The lung is seen to be collapsed and the pleural cavity filled with coagulated and frozen serum. The stomach is almost filled with clotted blood, and posterior to it can be seen a portion of the left lobe of the liver. The dia-

phragm is depressed, more so posteriorly over the liver than anteriorly over the stomach, the dome being practically obliterated.

Figure 3 is a view of the same section as Figure 2, after the pleural sac had been cleared of serum. This shows very well the atelectatic condition of the lung and brings into plain view the pericardium and the upper surface of the diaphragm. On the anterior surface of the upper lobe is a long fibrous scar, which upon section was found to extend into the lung tissue to the depth of almost one centimeter. The lung above this scar and also at the extreme upper portion of the left apex was adherent to the costal pleura. The aneurismal protrusion is shown very clearly in this figure as well as in Figure 2.

Figure 4 is a section cut just lateral to the left margin of the sternum, and the section is viewed from the right; this is the right side of the slab of tissue whose left side is shown in Figures 2 and 3. The aneurism and the pleural sac have been cleaned of serum and clots, and the vessels and air tubes of the lung of their contents.

In this section the aneurism comes into view for the first time. It is apparently of an hour-glass form and has burrowed through the chest wall above and below the second costal cartilage. The condition, however, is only apparent, as probably the sac eroded forward first through the sternum and then advanced laterally, destroying first the soft tissues and later the bone and cartilage. It is interesting to note the thinness of the anterior wall of the aneurism, consisting as it does only of skin and fascia. In the recent condition the whole of the hour-glass sac was solidly filled with laminated clot. Just below the posterior part of the sac is a small diverticulum, and anterior to this is a calcified lymph node.

The upper and lower parts of the interlobar pulmonary fissure are visible, and separated by it can be seen the collapsed lobes of the left lung. The atelectatic condition of the lung causes it to appear to be much more closely studded with vessels and bronchi than is really the case.

The heart comes into this section in the shape of the lower part of the left ventricle. The base of the heart has been pushed far downward by the aneurism, and hence the columnæ carneæ run much more horizontally than is normal. One papillary muscle shows very plainly.

Figure 5 is a view of the left surface of the next section. If the slices of tissue were placed together in proper order this surface would be in contact with that shown in Figure 4. It differs from Figure 4 in that the various cavities were not cleansed of their contents, the clot being allowed to remain in the aneurism and the coagulated frozen serum in the pleural cavity.

The aneurism is well shown, filled in this (its left lateral) portion with a firmly organized laminated clot. After thawing out, the clot was found to have the consistency of a stiffened sponge, and its interstices were filled with blood and serum. It is obvious at a glance how futile would have been an attempt to have treated this case by wiring.

When the pleural outlines are compared with those of the lung, the great degree of pulmonary atelectasis present can be well appreciated. The bronchi were filled with purulent secretion, and this condition may have helped to account for the patient's occasional rise in temperature.

The pericardial sac in this section was densely calcified.

The left ventricle is shown in this section, and one of the papillary muscles is beautifully depicted. The position of the latter helps to emphasize the abnormally horizontal position of the heart.

Figure 6 depicts a section through the middle of the sternum and spinal cord, the slab of tissues being viewed from the right.

The aneurism here appears in its largest dimensions and it is seen as it really is, one large single sac. It has eroded completely through the sternum, all of the manubrium and the upper part of the gladiolus being completely absorbed. The lower part of the latter projects upward into the aneurism as rough naked bone, apparently not covered by periosteum.

Only a small portion of the sac, the posterior portion, remained open as a blood channel during life. The remainder was filled with clot as described above, although blood and serum did ooze through the interstices of the clot and constantly drip through an opening in the skin on the anterior chest wall.

At the posterior part of the aneurism can b. ?en a small funicular depression with a tiny opening at the apex. This

opening was the point of rupture, and the flattened dark area posterior to it is the compressed left bronchus into which rupture took place. We were very fortunate in having this opening occur right in the plane of section. Above and posterior to the aneurism is the bifurcation of the trachea, which is filled with blood.

There was no direct communication between the sac and the esophagus, and the blood which filled the stomach was first coughed up and then swallowed. This process must have been going on for some time before death, since the latter was very sudden and apparently the result of suffocation.

The flattened mass of tissue between the sac and the vertebral column, and extending from the point of rupture up to the tracheal bifurcation, contains the left bronchus and the esophagus. The trachea was pushed very much to the right by the aneurism, and the left bronchus is seen on its way from this right-sided position back to the left lung. It is compressed between the sac anteriorly, and the esophagus and vertebral column posteriorly.

Many interesting things are shown in the heart. Above and anteriorly, and appearing as a tube-like structure, is the conus arteriosus of the right ventricle. At its posterior end can be seen the pulmonary valve separating the conus from the pulmonary aorta. All of these structures are much compressed and forced downward and backward. There must have been a greatly diminished blood stream going to the lungs, and this, in connection with the putting out of commission of the left lung, would amply account for the extreme dyspnea suffered by the patient. At the posterior part of the heart is the left auricle, in its natural position, but much altered from its normal ovoid outline. It is greatly flattened from before backward, especially at its upper part, where can be seen the flattened ostia of entrance of the two left pulmonary veins. The interference here with the return circulation readily could account for the left-sided hydrothorax.

Anterior to the left auricle can be seen the cavity of the left ventricle, with some of the chordæ tendineæ and columnæ carneæ. The thickness of the left ventricular wall is only apparent, as the section happened to traverse the interventricular septum.

Figure 7, like Figure 6, is a midsternal, midvertebral section, but differs from it in depicting the right side of the thorax, viewed from the left. Most of the points mentioned in describing Figure 6 will apply to this plate.

Two leaflets of the aortic valve are shown at the upper end of the left ventricle, anterior to the left auricle.

Posterior to the left auricle, and easily located by tracing it upward from the stomach, is the lower part of the esophagus. It is seen to be filled with clotted blood. In its upper part it was found to be greatly compressed by the aneurism. In view of this it seems rather odd that dysphagia had not been a more prominent symptom. While the patient had been unable to swallow solid food for some time before his death, liquids gave no great amount of trouble, and certainly the blood which reached the pharynx during the last hours of the patient reached the stomach without difficulty. The lower part of the esophagus, in addition to the stomach, was found after death to contain much blood.

In regard to the site of rupture, it is interesting to note the smooth crater-like character of the aortic intima at this point. There is no tearing of a thin vascular wall, as one might expect, but what appears to be a gradual absorption and final giving way of the thick aorticobronchial tissues at a point where pressure had been most marked and longest continued. The point of rupture was exactly where the column of blood driven into the sac by each contraction of the left ventricle would first impinge upon the aortic wall. At this spot was what appeared to the naked eye as a smooth foramen of communication between the aneurism and the bronchus, and the aneurismal intima and the bronchial epithelium appeared to be continuous structures, which is highly improbable.

Figure 8 depicts a section, viewed from the right, cut just lateral to the sternum, in the same relative plane on the right side as Figures 2 and 3 on the left. This plate shows the gradually decreasing size of the aneurism as the distance from the midline increases, and when compared with Figures 2 and 3, shows that the preponderance of the sac is on the left side, as would be expected. The right bronchus is filled with blood, this lending support t he belief that suffocation was the cause of death, but retains an approximately normal shape

and position, instead of being displaced and compressed, as noted on the left side.

Below the bronchus is seen the extreme right end of the left auricle, just medial to the place of entrance of the right pulmonary veins.

The main points of interest in this report we believe to be the following:

1. Photographs of the patient obtained at various periods during life showed successive steps in the growth of the protruding mass.

2. Frozen sections were made of a case which had had careful clinical study, and as a result conditions as they had existed in vivo could be accurately reproduced and deliberately studied after death. Search of the literature reveals the fact that this is the first opportunity of this kind which has arisen and been taken advantage of.

3. The exact site of rupture, and the cause and mode of death, could be determined and depicted with a degree of accuracy, certainty and detail which would be impossible of attainment in an ordinary autopsy.

4. The hydrothorax, the pulmonary atelectasis, and the extreme dyspnea are explained in a manner which by any other method of study would have been much less satisfactory, if at all possible.

5. The last statement is equally true of the anatomic relations. The altered position and general changes in the bronchial tree and other thoracic contents are depicted in such a graphic manner as to show to the laryngologist and internist alike what does take place in the presence of such a lesion as this large aneurism. It also suggests what may take place in some of our future clinical cases in the presence of other disturbers of the normal intrathoracic relations.

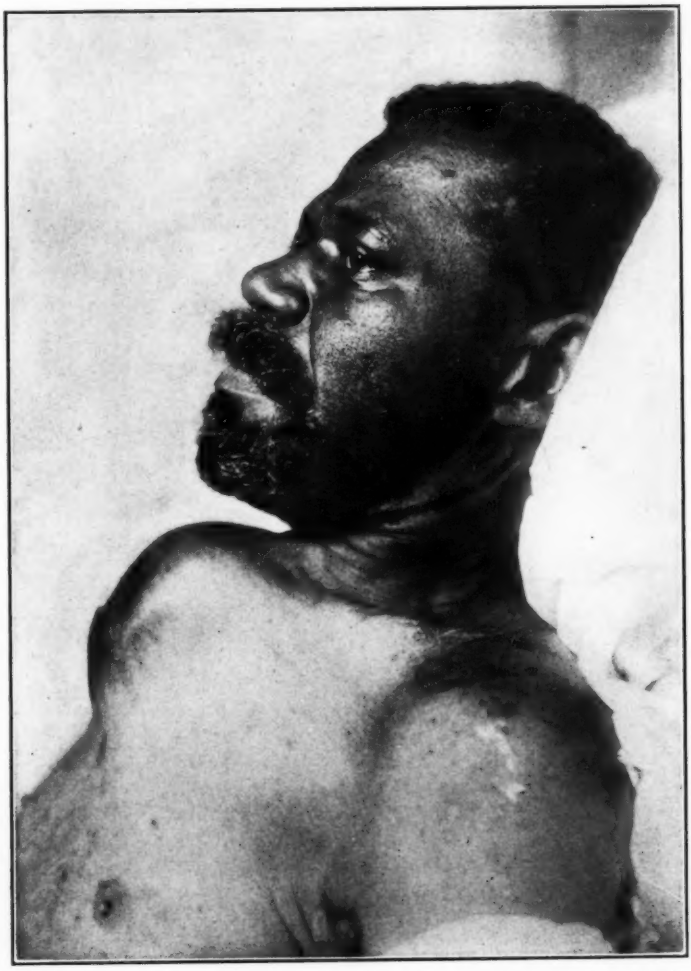

FIGURE 1.

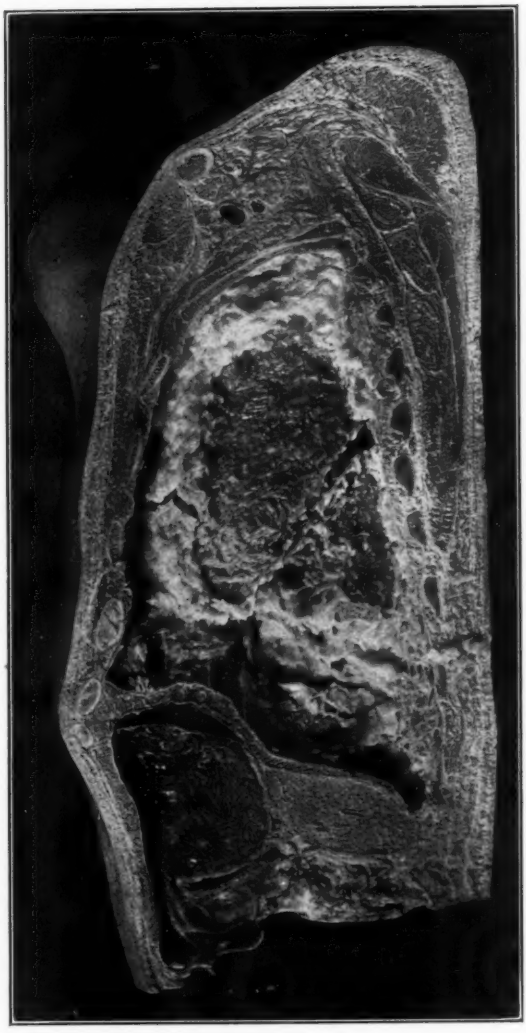

FIGURE 2.

FIGURE 3.

FIGURE 4.

FIGURE 5.

FIGURE 6.

FIGURE 7.

FIGURE 8.

XLV.

THE VALUE OF THE GALVANIC METHOD OF TESTING THE FUNCTIONS OF THE INNER EAR AND EIGHTH NERVE.*

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There are but three known methods of testing the function of the inner ear: the caloric, the rotational, and the galvanic. The first two methods are applicable to the semicircular canals only; the last mentioned is applicable not only to the canals, but also to the cochlea. There is but one method of testing the eighth nerve, and that is the galvanic. Accordingly, the galvanic test has a wider scope of application than either of the other two methods or both combined.

Let us next consider the relative accuracy and value of these three methods as applied to the semicircular canals in the order in which they are mentioned.

First, the caloric. This method has been tried out by numerous investigators and clinicians sufficiently to permit us to draw some definite conclusions. The caloric method is quite reliable when properly conducted and under favorable circumstances—when, at most, it can tell us that the labyrinth is either completely out of function or that it is not. If there is diminution of function, short of complete loss, we have no way of determining the fact by the caloric test, nor are we able to determine the presence or absence of an irritative process within the labyrinth; for instance, congestion, which so often precedes actual inflammation.

The caloric is by no means a quantitative test, in spite of the attempts of Ruttin to make it such. It can give us no information as to the amount of function or hyperfunction that may be present in the labyrinth. Its only value, there-

*Read before the American Laryngological, Rhinological and Otological Society, at White Sulphur Springs, 1916.

fore, as previously stated, is to determine whether the inner ear or, rather, the semicircular canals, are completely out of function or not. In making the caloric test the technic as practiced by the average clinician is faulty, in consequence of which errors of judgment may happen.

The average otologist selects cold water and syringes the affected ear with the patient's head upright, when he expects to obtain a rotatory or mixed rotatory and horizontal nystagmus to the opposite side if the inner ear is intact, and no reaction if it is destroyed. This was the method preferred by Bárány, and generally adopted by others. Since most of the cases to which the caloric test is applicable are those of acute labyrinth suppuration, where the patient already manifests a spontaneous nystagmus to the opposite side, it becomes a question of nice judgment to tell whether the cold water has increased the nystagmus or not. To overcome the possibility of mistaken judgment I have suggested the plan of syringing the ear with cold water with the head inclined to the opposite side, with the face forward, so that the ear to be tested is directed toward the zenith. Cold water will then produce a horizontal nystagmus of wide excursions to the affected side if the semicircular canals are reactive, while no effect will be produced if the canals are out of function. With the head in this position there is nothing like the possibility of mistaking the reaction that there is when the head is upright. A substitute for this method is to syringe the ear with head erect and subsequently turn the head to the side position, when a positive reaction may be expected to show itself by the same wide-excursioned horizontal nystagmus to the same side. One advantage the caloric test has over the rotatory test is that it is distinctly a unilateral test. Like the galvanic test, it can be applied to each ear separately.

There are certain circumstances under which the caloric test may not work altogether smoothly; however, with persistent effort they may occasionally be overcome. Among these may be mentioned large polypi in the external canal, large cholesteatoma obstructing the entrance of water into the middle ear cavity, foreign bodies in the canal, atresia (partial or complete, inflammatory or otherwise), excessive congestion, intact membrane, with tympanic cavity filled up with secretion,

etc. Anyone who has had a fair amount of experience can recall instances where one or other of these obstacles has hindered him in making the caloric test.

A partial correction of these conditions, when possible, followed by a second attempt with the caloric test, may result in the finding of a positive reaction when the first effort resulted in a negative reaction. None of these factors act as a hindrance to the galvanic test. Thus far it has been shown that the galvanic test possesses the one advantage claimed for the caloric test, and at the same time carries with it none of the handicaps.

Next the rotational. The one big disadvantage of the rotational test is that it is impossible to eliminate the fellow ear, which is overcome by the caloric and galvanic tests. Its one advantage over the caloric test is that it is a quantitative test; so, too, is the galvanic. The rotational test is a quantitative test of the two ears considered together, while the galvanic is quantitative for an individual ear.

The rotational test is of relatively greater value in testing a single ear when the function of the fellow ear is known to be normal, but when both are affected, either similarly or dissimilarly, allowances must be made accordingly. Even where these unfavorable conditions do not exist, it becomes difficult at times to figure out from the findings the exact conditions in the semicircular canals. It was originally claimed that the after-turning nystagmus in one-sided labyrinth destruction was reduced to eight seconds to the affected side, and to sixteen seconds to the unaffected side. But this is true only in case the semicircular canals on the unaffected side were functionating normally. In some cases we find both ears affected with chronic middle ear suppuration; in other cases, a previous neuritis or other pathologic condition that may have reduced the function in the supposedly unaffected ear, when the figures will be lower.

Let us cite three types of cases which are not uncommon:

Case 1.—Right side. An acute middle ear suppuration, followed by acute labyrinth suppuration. Left side normal. After-turning nystagmus to the right, eight seconds; to the left, sixteen seconds.

Case 2.—Right side. Chronic middle ear suppuration, fol-

lowed by acute labyrinth suppuration. Left side, chronic middle ear suppuration, in the course of which there has been a secondary plastic inflammation of the internal ear, with partial loss of function in semicircular canals. After-turning nystagmus to the right, five seconds; to the left, ten or eleven seconds.

Case 3.—Right side, chronic middle ear suppuration, followed by acute labyrinth suppuration. Left side, chronic middle ear suppuration, with congestion of labyrinth on the verge of inflammation. After-nystagmus to right, ten seconds; to the left, twenty seconds.

Other cases might be cited. However, it is not necessary for our purpose.

If we are to assume that a case is one of right-sided labyrinth suppuration because the after-nystagmus is eight seconds to the right and sixteen seconds to the left, our assumption is correct only when we can be sure that the left semicircular canals are in normal function. If the function of the left canals is impaired, then the reaction eight and sixteen seconds would be too high, and the probability would be that the function of the right canals is not entirely lost. On the other hand, if there exists hyperfunction on the left side because of a congestion, it would lengthen the after-nystagmus to both sides, in spite of the fact that the right side may be entirely destroyed.

It was because of these very factors that so much confusion existed among authorities in the early days (1906 and 1907), and still exists somewhat to the present day. Another factor that led to confusion on the part of some investigators, and came nearly putting this method of testing the labyrinth into bad repute, was the faulty technic which I had the privilege of pointing out to this society a year ago.

If we were to accept Bárány's exceedingly variable figures for after-turning nystagmus in normal individuals, the rotational test is surely a very unreliable method for examining the function of the semicircular canals.

The rotational method has been merely touched upon, but sufficient has been developed to show that at best it is a quantitative test of semicircular canal function of the two sides taken together, while the caloric method is a qualitative test of semicircular canal function of either side considered separately.

Eight years have passed since the writer first published the results of his investigations with the galvanic method. The figures which were then published, together with the conclusions, have been generally accepted, while Neumann assumed the credit, at least this is the impression to be gathered from certain American textbooks and the hearsay of returning students who have visited Vienna. To the best of my knowledge, Neumann never conducted experiments similar to mine, nor even published anything of a similar nature, nor had any direct or indirect connection with my experiments or publications of the results of those experiments. If wrong in a single statement of these facts, I shall be grateful to the one who points it out to me, and shall make public announcement of it with an apology to Neumann.

Coming back to the subject of the galvanic method of examination of the semicircular canal function, there is very little to add to what I have already published on the subject. During the last eight years where an examination called for a test of semicircular canal function, the galvanic method has never been neglected—and it might be added that there have been numerous calls for the test. Hardly any ear case that presented itself for treatment escaped the test. It has been tried repeatedly when the patient was too sensitive to submit to the caloric and rotational tests. The average case that balks at the caloric or turning test after the first attempt, consents readily to the galvanic. All other things being equal, this fact alone should give the preference to the galvanic method.

The next question to suggest itself is the value of the galvanic test from the standpoint of accuracy, as compared to the other two methods. It has been pointed out already that the caloric test is quite accurate in selected cases, but may not be in others. Should the examiner fail to recognize certain unfavorable factors (mentioned above), it is possible that he might be led to believe the semicircular canals are out of function when in fact they are not. Acting according to the findings under such circumstances, he might not do what is best for the patient's interest. Such a mistake could not happen with the galvanic test.

If we were to accept Bárány's figures for after-turning nystagmus, we are forced to conclude that the rotational method

is to be mentioned only to be condemned. We find Bárány's figures for after-turning nystagmus to vary from one to one hundred and twenty seconds, with marked variations on different days, and marked variations on two sides on the same day. His figures in disease overlap considerably those in health. I am less pessimistic—or, rather, the results of my experience lead me to look more favorably upon the rotational test than it is possible for anyone else to, who accepts Bárány's figures as conclusive.

Up to the present time I have been occupied in pointing out certain limitations and inaccuracies of the caloric and rotational tests; now let us consider the galvanic test from the standpoint of accuracy; its wider application compared with the other two methods having already been referred to when discussing the caloric and turning methods.

In making the galvanic test certain essentials are required: (a) A suitable electrical apparatus with clean contact points. (b) Even more important is an accurate milliamperemeter. (c) A reversing switch under the control of (d) a capable assistant who controls the polarity, the amount of current, and observes the milliamperemeter. (e) Two electrodes, one about two inches square and flat, and the other a small ball electrode (about a quarter inch in diameter, although one-half inch will work satisfactorily). Both electrodes should be wrapped snugly in moist cotton or gauze.

Before starting the test, examination should be made to see if the patient has any spontaneous nystagmus. Its presence or absence should be noted on the patient's record. After soaking the electrodes and the parts to which they are to be applied with warm salt solution, we are ready to begin. The large flat electrode is held by the patient—it does not signify in which hand. The patient's head is tilted slightly backward to permit of better observation of the eyes by the examiner, while he is directed to look straight ahead, which in effect is slightly downward, considering the position of the head inclined backward. The examiner elevates the lid of the eye to be observed with the thumb of the left hand when applying the ball electrode with his right hand to the patient's left ear, and vice versa. To be accurate, I will emphasize the fact that the ball electrode is applied to the tragus, and the tragus

is pushed into the external canal. I am anxious to make this clear, since someone recently, in a meeting of the Philadelphia Laryngological Society, claimed he could not get the results he had hoped for with the galvanic test. Upon questioning him he answered that he applied the electrode to the patient's mastoid, after the manner indicated in my book, which evidently he had not read carefully.

In making the test my back is more or less to the instrument. I do not permit myself to know the polarity used. The moment a reaction is noted it is called out to the assistant with the polarity, and the assistant calls back that the polarity is correct and announces the milliamperemeter reading, when a record is made of it. The polarity is switched or not as the assistant sees fit, the important point is that he is not to indicate it in any way to me, the object being to eliminate the possibility of any guessing. Including my published experiments of eight years ago and those conducted since, there have been examined and recorded a few thousand cases. Among these cases are included normals, deafmutes, one-sided labyrinth destructions, acute and latent labyrinth suppurations, old cases of plastic labyrinthitis, unilateral and bilateral, recent as well as old cases of meningitis, some with complete and others with partial loss of function, hemorrhage into the labyrinth, fistulas of the labyrinth, internal auditory canal tumors, herpes zoster, multiple neuritis of the cranial nerves, early and late syphilis of internal ear and nerves, skull fractures, gunshot wound of the ear, cases with middle ear catarrh, others with middle ear suppuration with hyperemia of labyrinth. Many of these cases have been reported singly from time to time during the last eight years.

As a result of these experiments I am led to conclude that the normal reaction from the combined inner ear and nerve is:

Right Ear: Kathode 4 ma., nystagmus to the right. Anode 4 ma., nystagmus to the left.

Left Ear: Kathode 4 ma., nystagmus to the left. Anode 4 ma., nystagmus to the right.

That is to say, the kathodal reaction of one side balances with the kathodal reaction of the opposite side.

That the anodal reaction of one side balances with the anodal reaction of the opposite side.

That the kathodal reaction balances with the anodal reaction of the same side, and that the average reaction for normal individuals requires a current strength of about four milliamperes.

In the case of recent labyrinth suppuration, say in the first week, right side affected and left side normal, we have:

Right Ear: Kathode 7 ma., diminishes the existing nystagmus to the left, while kathode 8½ ma., produces nystagmus to the right Anode 1 ma., increases the nystagmus to the left.

Left Ear: Kathode 1 ma., increases the existing nystagmus to left. Anode 7 or 8 ma., arrests the nystagmus to left, or may throw it slightly to the right.

The explanation of this reaction I have given elsewhere, but will repeat it. Since the normal tonus is equivalent to four milliamperes, it takes four milliamperes suppression (with the anode) to permit the normal tonus of the untouched side to pull the nystagmus over to its side. For instance, in the case just cited above it takes from seven to eight and one-half milliamperes on the right side to overcome four milliamperes loss of tonus from labyrinth suppuration. Since the tonus of one side must excel the antagonist by four milliamperes, it takes four plus four milliamperes, or eight milliamperes. Since the right labyrinth is destroyed by suppuration, the reaction with one milliampere anode applied to the right side must have exercised its influence on the nerve, showing that the nerve is reactive for some time after the labyrinth is destroyed.

At a later date, which varies from a few weeks to several months, the galvanic reaction changes, and we find:

Right Ear: Kathode—10, 12, 20 milliamperes, or even more, in fact, using the strongest current the patient can stand, produces no reaction. Anode—with the strongest current there is no reaction.

Left Ear: Kathode 1 ma., produces a distinct nystagmus to the left, or it will increase the nystagmus where it was present spontaneously. Anode 8 ma., occasionally causes a spontaneous nystagmus to the left to disappear, otherwise there is no reaction. Twenty milliamperes or more will not produce a nystagmus to the right.

The reaction just cited corresponds to the findings of a total loss of function on the right side that occurs after destruction of the nerve following neuritis or tumor of the internal audi-

tory canal, so that we may conclude, with some feeling of certainty, that all cases of labyrinth destruction, whether from suppuration or otherwise, is followed eventually by secondary degeneration of the nerve.

Another reaction which I have found and recently reported to the Philadelphia Laryngological Society corresponds to a case of eighth nerve neuritis of mild degree in which the reactibility of the affected nerve is excessive. For instance, take a case of right sided neuritis with hypersensitiveness.

Right side: Kathode 1 or 2 ma., nystagmus to the right. Anode 6 ma., nystagmus to the left.

Left side: Kathode 6 ma., nystagmus to the left. Anode 1 or 2 ma., nystagmus to the right.

The explanation is that the right nerve was affected with a pathologic irritation which required less than the normal kathodal stimulus to throw a distinct nystagmus to that side. Whereas, because of the hyperirritability of the affected nerve, it took more than the usual current strength to suppress the total tonus with the anode and throw the nystagmus to the opposite side. Further report of this case will be reported later.

In cases of labyrinth congestion which occasionally accompanies acute middle ear suppuration with membrane intact, we may find a similar reaction, when it becomes a clear indication to operate promptly for the relief of pressure because of the danger of a supervening labyrinth suppuration.

The case of neuritis referred to above developed a more aggravated form later, when the reaction changed entirely, and with it the spontaneous nystagmus jumped to the opposite side. The value of the galvanic test in this case was to point out the fact that the case was getting worse instead of improving. I might have been able to ascertain this fact by other methods,but they would have been more painful and less accurate. Fortunately, in the treatment of eighth nerve neuritis we are more often able to record a change in the opposite direction, indicating improvement and eventually restoration of function. This favorable turn occurs quite frequently in cases of syphilitic affections of the inner ear and nerve during the late secondary or early tertiary stage.

My first inclination in presenting the subject of the galvanic

method of examining the function of the inner ear and eighth nerve before this society was to consider the subject exhaustively, listing experiments and classifying cases. Later it occurred to me that such a paper would tend less toward creating an interest in the subject than would one that should be a summary of conclusions reached from a fair experience with this and other tests of the labyrinthine functions, hoping thereby to invite criticism which would tend more certainly to bring out points of interest and more vividly than I could hope to do otherwise.

CONCLUSIONS.

1. That the galvanic test is more accurate than either the caloric or rotational test in determining the function of the semicircular canals.

2. Besides being more accurate, the galvanic test is the least annoying to the patient, the most sensitive, and the easiest to control of the labyrinthine tests.

3. That the galvanic test can be applied as a unilateral test of semicircular canal function in all sorts of pathologic conditions, which is an advantage that cannot be conceded to the caloric.

4. That the galvanic test is applicable to cases of suspected unilateral labyrinth suppuration with obstruction in the external canal where the caloric may fail us.

5. That the galvanic test is a unilateral quantitative test of semicircular canal function, which is a distinct advantage over the rotational test, which at best is a bilateral test.

6. That the galvanic test is the only one we possess for testing the function of the eighth nerve in cases of neuritis or cases of secondary degeneration following destruction of the inner ear.

7. That the galvanic test is the only one we possess whereby we can make a differential diagnosis between labyrinth destruction, pure and simple, and eighth nerve neuritis.

8. That the galvanic test is the only test available for determining the progress of eighth nerve neuritis, whether favorable or unfavorable.

In pointing out the greater applicability and value of the galvanic test as compared to the other tests, I do not wish to

be misunderstood as condemning in any way the other methods; on the contrary, I find them of considerable value and use them in every instance where it is possible. My intention is rather to show that the galvanic test is, from every viewpoint, the best, and is the one of choice where a single method is to be used.

Concerning opening and closing nystagmus, nothing has been said in this paper, for the reason that it is of secondary importance and does not cover the object of my paper. It would therefore be redundant.

No reference was made to the fistula test, since it does not belong to the class of tests for comparison. It is applicable to a more limited field, and really deserves a separate consideration.

The spirit that prompts the writing of this paper is to awaken interest in the subect, to invite criticism and to urge the more general use of this method, for no examination of the labyrinth can be considered complete where the galvanic test has been omitted.

XLVI.

HEMORRHAGIC MASTOIDITIS.*

By G. W. Boot, M. D.,

Chicago.

Case 1.—A. B., aged seventy-eight years. Left ear began to ache four days ago. Three days ago free paracentesis was done, followed by a profuse discharge of bloody serum ever since. Cultures and smears gave streptococcus. Temperature normal. Yesterday the mastoid became very tender. No edema. No fever. Leucocyte count, 9500. Seen in consultation by Dr. Shambaugh, who agreed with the diagnosis of mastoiditis, after transilluminating and finding the mastoid dark to transillumination. Operation January 7th, at the Evanston Hospital, under local anesthesia, using one per cent novacain plus adrenalin chlorid. This was done on account of the patient's age and kidney condition. He had had a chronic nephritis for a long time before developing the ear trouble. Good anesthesia was obtained. All the mastoid cells were found filled with dark clots. The mastoid was large and very cellular. All the cells, including the antrum, were opened. Only traces of pus were found in the antrum. The sinus was not exposed. The wound was packed with iodoform gauze and partly closed with clips. Condition at the close of operation excellent. Patient sat up and called for something to eat and drink. There was very little bleeding during the operation.

January 8th, noon. Temperature, 102.5°; pulse, 100. Leucocyte count, 17,600.

January 9th. Patient had a good night. 8 a. m., temperature, 98.4°; pulse, 110. 10 a. m., temperature, 101.8°; pulse, 96. Leucocyte count, 26,500. 10 p. m., temperature, 103°. Red and edematous around wound. Ten cubic centimeters of antistreptococcus serum given.

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January 10th. Temperature, 101.6°. Well marked facial erysipelas present. Ten cubic centimeters of serum given. Erythematous surface painted with tincture iodin.

January 11th, 9 a. m. Temperature, 99°; pulse, 88. Erysipelas has spread over face above mouth, including right auricle. Left ear is clearing up. Is better this morning. In the afternoon his temperature was 98.6°; pulse, 88, slightly irregular. Looks used up. Has not eaten today. Says his stomach is acid.

January 15th. Complains of pain in the middle of the outer surface of the left leg. There is a reddened swollen area here that measures about six by ten centimeters. This was painted with tincture iodin. Temperature has risen to 99.2°. Tongue is red, dry and fissured.

January 17th. Temperature normal. Reddened area on leg has gone, but left ankle is red, hot, swollen and painful. Mastoid wound is not granulating, but has considerable grayish sloughing connective tissue exposed in it. Facial erysipelas is all gone.

January 20th. Cellulitis of left leg is present. Aspiration failed to find pus. Leucocytosis of 30,000, of which ninety per cent are polynuclears. Boric acid compresses ordered applied to the leg.

January 22d. Small abscess over lower right orbital margin opened and pus evacuated. Abscess over left external malleolus opened and drained. Hot boric compresses applied.

January 23d. Temperature, 98.6°. Very weak and listless. Tongue covered with sordes. Mastoid wound irrigated. Abscess at ankle irrigated. Not so tender in left popliteal space as he has been.

January 24th. More tender in calf of left leg. Mentality poor. Was delirious all night.

January 27th. Patient appears a little better. The leg is not as much swollen, and his mentality is a little better. His tongue also looks better. He is taking liquid peptonoids.

February 2d. Patient developed another attack of facial erysipelas yesterday and died this morning.

Case 2.—This case I am allowed to report through the courtesy of Dr. Joseph C. Beck, in whose service it occurred at Cook County Hospital. W. G., admitted to Ward 20, Decem-

ber 4, 1916. Jewish sailor, aged twenty-seven years, single. Patient entered the hospital on November 16, 1916, with an admitting room diagnosis of probable renal tuberculosis. His complaint was of pain below both knees, in the region of the right hip, and in chest and shoulder.

Onset and Course.—Patient's illness began seventeen days ago with sharp pain over both tibiæ just below knees. Next day he had a similar pain in both hips, while the pain in the knees improved. Soon he had pains shooting up to the chest, under the ribs and to both shoulders. These would last two or three seconds at a time. He has not been nauseated.

Past History.—Never sick. Had gonorrhea seven or eight years ago. Had a sore which a doctor called a soft chancre eight or nine months ago.

Family History.—Father and mother alive and well. One sister dead at birth. Nine brothers and sisters alive and well.

Habits.—Formerly a moderate drinker. Does not use tobacco.

Physical Examination.—Patient is well developed, but acts as if he were in considerable pain. Scalp, ears and nose negative. Pupils equal and regular, reacting to both light and accommodation. There is pyorrhea. The gums are sore and the teeth carious. The pharynx is injected and the tonsils enlarged. The postcervical glands are enlarged. Chest is normal. There is tenderness to the right of the umbilicus, over the gall bladder, and in the right lumbar region. The upper extremities are normal. There is tenderness over the left ilium and behind the left hip joint. There is a slight nodular swelling over heads of both tibiæ. Crepitus may be felt here.

Blood Pressure.—Systolic, 118; diastolic, 80. Wassermann plus four.

Diagnosis.—Luetic periostitis, pleuritis.

November 28th. Left membrana tympani is red and bulging. Paracentesis done under local anesthesia. Much pus found. Shortly afterwards patient began to moan and seemed to lose consciousness. An hour later he was better, but did not remember the attack.

November 29th. Foul discharge from left ear. Tender over mastoid.

December 1st. Patient is moaning constantly. Complains of pain in left mastoid.

December 2d. Left mastoid tenderness is extreme. No edema or bulging. Ear is draining freely.

December 4th. No induration over mastoid. Stuporous. Answers questions with difficulty. Perspires profusely. Pulse slow, full and regular. Temperature, 100°.

The X-ray report on November 28th was as follows: The mastoid cells are very extensive on both sides. The right side is normal in appearance, the left nearly so, being very slightly less clear in outline in the central region. The peripheral cells are clear. Another X-ray report, dated December 5th, states that the "left mastoid region appears to be typically normal. The right mastoid slightly less clear than the left, but I am unable to state that this indicates pathologic change." Patient appears quite toxic. There is profuse discharge from the right ear. The drum is red and there is considerable tenderness on pressure over the mastoid. There is no rigidity of the neck and no Kernig. The knee jerks are lively. The pupils react normally and are equal. There is no swelling of the optic discs. There are no focal symptoms.

A mastoid operation was done on this date. The mastoid was found to be large with numerous cells of moderate size. All the cells were found filled with very dark red, almost black, blood clots. There was a small amount of pus in the antrum and some in the larger cells. Cultures from the mastoid gave a streptococcus. Patient made an uneventful recovery, and was discharged January 3d.

I have found but one case of hemorrhagic mastoiditis reported in the literature—a case reported by Loeb in the ANNALS OF OTOLOGY, RHINOLOGY AND LARYNGOLOGY for September, 1915.

Loeb's patient was a nurse who had had no previous ear trouble. She was taken with an acute suppuration of the middle ear which discharged spontaneously inside of twenty-four hours of the onset a large quantity of serosanguinolent fluid containing a diplostreptococcus. The mastoid operation was done inside of four days from the onset of the disease, and the mastoid cells were found filled with dark blood clots. No pus or granulation tissue was found. Cultures from the mastoid were fatal to rabbits. The patient recovered.

The conditions in these three patients were much alike.

The onset was severe. The discharge was a bloody serum and was profuse. The mastoid tenderness was very marked. The temperature was moderate. There was a considerable leucocytosis, and all gave the streptococcus in smears.

My case and Loeb's were operated on early because of the apparent severity of the attack and of the type of the infection. The advanced age and the presence of chronic nephritis likewise influenced me in operating early and under local anesthesia. Even then my patient developed a blood infection, as shown by the abscesses over the malleolus and under the eye, and the second attack of erysipelas beginning on the opposite side.

The formation of these blood clots in the mastoid cells resembles the formation of the exudate in the alveoli in lobar pneumonia. The preformed cavities are filled with the bloody fibrinous exudate. On the other hand, the connection of this process with erysipelas is clearly shown in my case. The presence of bullæ in the canal and on the membrana tympani in influenzal otitis media might cause one to suspect a relationship of this condition to influenza, but the influenza bacillus was not found. The exudate also was not serous but fibrinous.

A probable point in differential diagnosis is found in that the X-ray plates in Dr. Beck's case showed very little change from the normal, while transillumination in my case gave a marked shadow. If both transillumination and X-ray examination were done on the same patient, it would probably be possible to make a diagnosis in advance of operation.

Whether one should operate early or late in these cases must be left to the judgment of the individual operator until more such cases have been reported. Ordinarily streptococcus infections require earlier operative interference than other types of infection because of the greater amount of destruction done by the streptococcus. On the other hand, the liability of the soft parts to develop erysipelas and cellulitis must be borne in mind, particularly in patients who have chronic nephritis.

XLVII.

HEMORRHAGE IN RHINOLARYNGOLOGIC WORK.*

By Arthur M. Corwin, M. D.,

Chicago.

Leaving out of account the uterus, perhaps the nose is responsible for more spontaneous loss of blood than any other region of the body, and bears its full share of accidental and operative hemorrhage as well.

And when one recalls the prime value of the blood as water carrier, food conveyor, oxygen bearer, distributer of heat, scavenger of tissue waste, equalizer of metabolic balance through the influence of hormones widely collected and widely delivered; and when one remembers the important defensive function which the blood has through its antibodies, its opsonins and its phagocytes, the rhinolaryngologist assumes added responsibility as conservator and prophylactor against blood waste.

This brief paper does not aim to summarize all the data suggested by the title. Rather shall we speak of some types of hemorrhage, emphasizing some differences among individuals of the bleeder group with which we occasionally have to deal.

It is not uncommon for physicians, even laryngologists, to apply the word bleeder or hemophiliac in a loose way to describe the episode of vicious epistaxis, or severe, possibly fatal postoperative hemorrhage marked by prolonged bleeding time and delayed coagulation, but without adequate grounds for such a diagnosis. Hemophiliac applies to a distinct type. We have in mind several cases in which the term was misapplied; for example, a boy ten years old suffered from a low grade toxemia following a mild attack of tonsillitis, which apparently cleared up locally, but left him weak and progress-

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ively losing. When we saw him, after nearly four weeks in bed, he was having a severe persistent epistaxis which oozed considerably after posteroanterior packing. He was oozing from his gums, exhibited numerous small ecchymoses on his legs and back, and subconjunctival hemorrhage. There was tenderness over a palpable spleen, and enlarged cervical glands. The viscera otherwise apparently normal. Temperature irregular, not above 102° F., at the highest. Pulse, 100 to 110. Hemoglobin, seventy-five per cent; red cells, 4,000,000; leucocytes, 9,500, practically normal. Coagulation time was much increased, the blood remaining grumous and unclotted in the basin for nearly an hour.

The bleeding was stopped by repacking the nose with coagulose on gauze and by injection of pituitrin every six hours for three doses. On the second day he was given twenty cubic centimeters of blood serum from his brother. This, together with out-of-door tr atment, arsenic and iron, was followed slowly b" ecovery, in spite of the fact that purpura in t. ion is not a good sign, suggesting, as it does, generation of the intima.

The boy h. been subject to severe nose bleeds, and the family, aroused by leading questions on the part of the attending physician, had dug up a number of supposed hemorrhages among relatives. These, upon close questioning, did not prove reliable, and the possible supposition of hemorrhagic diathesis complicated by an infection dissolved into the diagnosis of purpura.

And we recognize that purpura, whether simple or hemorrhagic, is merely a symptom complex resulting from toxemia of a wide variety with no single pathologic foundation.

Rhinolaryngologic hemorrhage, purpuric in character, is an incidence in scurvy, phosphorus or snake venom poisoning, the grave cachexias, leukemia and anemia, and bacterial infections of many kinds. They do not come to nose and throat men, as a rule, except in the service of large hospitals. To differentiate these purpuric types of hemorrhage, heredity is wanting, except in rare instances; in most cases they are individual bleeders, not hemophiliacs; they frequently show various grades of blood change, and there is fatty degeneration of the capillary walls. But the blood frequently clots in normal time. In any

case, the diminished clotting is nothing like as marked as in hemophilia; the blood platelets are also apt to be diminished.

The hemorrhage of venous stasis is, fortunately, more interesting to us academically than practically, for it is rather rare. The nose bleeds, and other usually trivial bleedings, subcutaneous or otherwise, which are occasionally seen in pertussis, are of this character.

The varices at the base of the tongue are rarely the site of hemorrhage, and yet their rupture may give extreme anxiety to both patient and physician unless identified. To illustrate: we recall a woman of forty years, apparently well, though when she presented herself she was a trifle short of breath, cyanotic about the lips, and suffered from a cough, with spitting of blood, which had occurred off and on frequently for some weeks.

The patient's own diagnosis was, of course, tuberculosis, but though there was well marked broken cardiac compensation, with moderate edema of the feet and ankles, etc., in the course of an old mitral lesion, the hemorrhage was not from the lungs, as was supposed, but from a break in a large vein at the base of the tongue. The treatment was naturally not local, but proper rest and cardiac medication, which was promptly effective in checking the bleeding permanently. This type of hemorrhage from throat and nose has been reported in cases of alcoholic cirrhosis.

The following is an example of laryngeal hematoma which we saw in a man of forty-five years, who had suffered from a severe subacute tracheobronchitis with severe paroxysms of cough. He was free in his use of alcohol, showed evidence of hepatic cirrhosis, with the usual gastric disturbance. After an attack of coughing, he felt a fullness in the throat, which increased to a sensation of choking, and within a short time was followed by laryngeal stridor, dyspnea and great anxiety. The pulse was rapid, and the patient sitting upright in a cold sweat, evidently in a serious condition, suggesting edema of the glottis. The examination was difficult; with the light of the house lamp we finally made out a large bluish mass obscuring the glottis entirely, but a little more to the right than to the left. With a laryngeal speculum and a long straight

bistoury, wrapped with cotton except at its point, a short incision was made, followed by a burst of venous blood, giving prompt relief to dyspnea and voice. This hematoma was on the right side of the glottis, seemingly arising from the arytenoid. Incidentally it was not difficult to entirely reform the patient's alcoholic habits after that experience.

Returning to hemophilia proper, while we speak familiarly of this affection, it is not common in America, though it is said to occur twice as frequently in Germany as elsewhere. One of the very few cases the writer has ever seen was in the charity hospital at Berlin. It would be interesting to know how many cases—or rather how few—of real hemophilia have been seen by the members of the society. We venture to say they have been very few, counting the cases seen as hospital curiosities.

The speaker has seen but two cases, neither of them personal patients. In fact, we, as a profession, have not learned much more about the hemorrhagic diathesis than we were taught as students; that it is characterized by obstreperous, well-nigh uncontrollable bleeding, upon slight provocation; that it occurs spontaneously, subcutaneous and deep seated, or superficially from trivial wounds. Why it does not begin until after the second year of age, why it tends to wear out and disappear in adult years, if the patient lives long enough, is as much a puzzle as is the cause of this mysterious malady. While we were taught that it was the female who always transmitted the tendency or potentiality, and so made good Kipling's reference to her deadly reputation, we have more recently learned that she hands it invariably to a male and is herself unaffected; no female is a hemophiliac. This power of transmission through the unaffected female is also exemplified in color blindness, night blindness and diabetes insipidus, and as reported in ichthyosis and pseudomuscular atrophy. Though Virchow, and indeed earlier investigation, leads us to believe that there was in hemophilia some peculiar change in the vessel wall, a greater thinness and fragility, evidence has disproved this, or at least none has confirmed it. The three hundred and thirty-four patients collected by Grandidier revealed one hundred and sixty-nine (half of them) as

epistactic cases. But the value of this ratio is minimized by the fact that Grandidier believed that females as well as males were hemophiliac in the ratio of one to four. His report contained forty-eight female bleeders, now known to be spurious in the light of the work of Bullock and Fildes, who proved that only males are actually affected. The bleeding of those forty-eight must have been due to some form of purpura or other acute condition. The real bleeder diagnosis is then summed up in:

1. Definite heredity, through unaffected females (law of Nasse).
2. Prolonged bleeding time.
3. Coagulability markedly diminished.
4. Normal blood picture except leucopenia, if anything. Blood platelets not diminished, as some have reported.
5. Origin in early youth.

We are nearly as much at sea why the hemophiliac loves to bleed as we are why normal blood loves to clot.

In view of our simple conception of coagulation, twenty-five years ago, the up-to-date biochemist seems vastly learned until we come to find that his rich vocabulary is but a cloak of ignorance, like the words idiopathic and diathesis. The foremost hypothesis concerning blood clotting may be visualized by the following verbal dominoes set on end in a row: when the first falls against its neighbor, they all go down seriatim to the last, fibrin, clotted blood. To be specific, thrombokinase or kinase, not considered present in circulatory blood, but present in shed blood, is supposedly derived from disintegration of fixed or blood cells and platelets; this acts upon another hypothetical substance, prothrombin, which in the presence of calcium salts and another substance, thrombin, somehow attracts or gives rise to fibrinogen, and out of the action and reaction springs that saving process—clotting of the blood—which Albert P. Matthews of Chicago University calls "essentially the crystallization of a protein substance, fibrin, in the form of liquid crystals which coalesce, to form fibrin strings." This is all very clear, of course. But though we know next to nothing of the how of the process, clinically the result is a vital matter.

We know physiologically that blood clotting is accelerated by raising the temperature and retarded by lowering the temperature, and yet we slap on ice bags following tonsillectomy, presumably for their reflex effect upon vasomotor constriction. But hot pledgets, not too hot, inserted directly into the wound will act as magically to check hemorrhage in the throat as in other surgical fields. Personally, we have better results by banishing the ice bag as a postoperative routine and administering five to ten grains of phenacetin with or without one-eighth of morphin for adults, after the stomach has reached postanesthetic quiet, to control early pain.

The laboratory again tells us that blood clotting is stimulated by the administration of an anesthetic, a point perhaps in favor of the good old ether anesthetic versus local anesthesia. On the other hand, says the laboratory, addition of carbon dioxid and withdrawal of oxygen lessens the tendency to clotting. This may partly account for the initial free bleeding in ordinary cyanotic gas anesthesia, or gas oxygen anesthesia, administered improperly. This is one reason why we personally do not like a socalled gas oxygen anesthetic in tonsil work, if it is given by an assistant inexperienced with it. But when administered by an expert, using an up-to-date device, accurately releasing each gas in the mixing chamber, there is no anesthetic to compare with gas oxygen in tonsil surgery. The patient thoroughly under should not show any cyanosis whatever.

Again, the physiologic laboratory demonstrates that blood received in an oil lined receptacle, under an oil film, clots slowly. This principle, applied in the use of short gauze strips boiled in vaselin at the time of operation, gives support to tissue, a clean surgical dressing, with less irritation than dry gauze or sponges. The blood does not penetrate its meshes to clot in a hard mass, difficult to remove and painful in the process. When such oiled packing is not too fine, enough seepage takes place to eliminate cocain still remaining in the tissues and to relieve congestion after the operation.

That calcium salts added to drawn blood stimulates coagulation is a familiar fact experimentally. Clinically, calcium salts have not stood up to the theory when administered inter-

nally, though we are still in the habit of giving calcium lactate or chlorid. But applied to the wound upon pledgets soaked in one or two per cent solution, as advised by Kean of Philadelphia, chlorid of calcium is of distinct benefit in checking and preventing hemorrhage. The internal use of gelatin is illogical as, according to Sahli, it does not reach the blood as gelatin. Adrenalin internally is reported to be inert by some, though advised by others, as a raiser of blood pressure; it seems to be contraindicated except for the local effect, as all of us are accustomed to use it. However, in our appreciation of adrenalin we err too often in using it too concentrated. A 1:1000 solution produces a powerful contraction and quite as radical relaxation afterward, as action and reaction are apt to correspond. In our own experienec a strength one-fourth or one-tenth the commercial solution will give better results.

But the most useful of all means by which we overcome pathologic hemorrhage is that other product of the physiologic laboratory, the knowledge that blood serum, or, under proper circumstances, whole blood, introduced into the circulation stimulates clotting as it does in drawn blood. To the report of Weil in 1907 concerning his studies of hemophiliac blood, we owe most of our brilliant results with the use of animal serum in checking hemorrhage.

In brief, we know that animal serum injected into a seemingly hopeless hemophiliac will usually save the patient. It will act as well in many cases of purpura and other little understood hemorrhagic types. Its prophylactic power when introduced into known bleeders will bring about a normal condition which in hemophilia will last for three weeks or as many months, and thereby permit surgical procedures which were otherwise impossible. Though rabbit, beef, horse and human serum produces like beneficial effect, heterologous serums are inferior to human serum in some essentials. Beef serum is not to be used because of its severe anaphylaxis. Horse serum is less anaphylactic, but at times seriously so, as illustrated in the use of diphtheria antitoxin. Blood serum from one of the same family is preferable, because of the great danger of anaphylaxis if unrelated human serum or heterologous serum is used. Fresh normal human blood serum

is obtained precisely as in making a Wassermann. Serum obtained by centrifuging is less active than that obtained in the clotting process. Serum older than forty-eight hours loses in activity with age, even though it be kept properly cool and aseptic. Twenty to forty cubic centimeters, repeated in eight to twenty-four hours, is safe dosage, unless anaphylactic symptoms contraindicate; in this case human serum will fill the bill. Precipitated serum in the form of powder is approved because of its availability at critical moments. Coagulose, applied dry or in solution, has proven exceedingly reliable in epistaxis, after adenoid removal, in tonsillar hemorrhage, and in a simple obstinate case of bleeding after a tooth extraction. Coagulose is made from human blood serum, and is theoretically far superior to coagulin from horse serum. But with coagulin we have had little personal experience.

How far is the coagulation test advisable as a routine in operative rhinootolaryngology?

We have not used it invariably and have, fortunately, never yet lost a case from hemorrhage. But the same principle of nonuse applied in the field of fire insurance would be disastrous in the long run. We have in a large number of tonsil cases used ampules of pituitrin with satisfaction. M. A. Goldstein in 1913 recommended systemic coagulation tests in every case of prospective tonsillectomy, and a serum injection when the coagulation time exceeds seven minutes. This is probably good practice, but will probably never become popular in the light of majority operative freedom from hemorrhage. Fleisch emphasized the prophylactic use of animal serum in 1911. Welch reports one hundred per cent cures in the New York Lying-in Hospital in hemorrhage of the newborn, which, by the way, is not hemophilia, but more akin to purpura. On the other hand, the October 26, 1912, issue of the *Journal of the American Medical Association,* details a fatal case of hemorrhage in a child fifteen months old, from accidental wound of the tongue, despite subcutaneous use of human serum. The question is in that case whether direct transfusion of the family blood might not have resulted differently.

Surely, no laryngologist can allow a patient to die of hemor-

rhage without resorting to transfusion, if there is time, despite the dangers of infection, thrombosis, emboli and hemolysis. The syringe canula system of transfusion described by Dr. E. Lindermann, in the October 31st issue of the *Journal of the American Medical Association,* has made the procedure less of a bugbear. Perhaps the best recent collaboration upon the subject of serum treatment of hemorrhage is that by Dr. Henry Forbes, March, 1916, in the ANNALS OF OTOLOGY, RHINOLOGY AND LARYNGOLOGY. The bibliography he has gathered is well worth investigating.

XLVIII.

SUBPERIOSTEAL ABSCESS OF THE MASTOID—CURE BY PARACENTESIS.*

By Samuel Salinger, M. D.,

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I desire to present the histories of two cases of subperiosteal abscess of the mastoid in children, with recovery through conservative treatment; also, a consideration of the anatomic features involved and a discussion of the procedure advisable in such cases.

The first is that of a boy of four years, whom I saw for the first time on May 28, 1916. He had had an acute rhinitis the week previous, which was uneventful until the appearance of pains in the right ear on May 25th, accompanied by fever lasting one day. After a twenty-four hour remission, pain and temperature reappeared, with swelling behind the auricle. Upon examination the child was flushed and restless, temperature 101° F.; pulse, 130. The right auricle was reddened and projected outward from the head, with obliteration of the posterior auricular fold, edema behind and above the auricle, redness of the overlying skin, and acute tenderness to pressure over the antrum and tip. The drum membrane was of a bluish purple color and markedly bulged, all landmarks being obliterated. A paracentesis was done, and was immediately followed by a copious discharge of pus. On the next day the discharge was less marked, the pains had increased, temperature was 101.8° F., edema had spread, and upon palpation there was distinct fluctuation. The drum was still deeply congested, and there was a slit-like perforation in the posterior superior quadrant in which pulsation was visible. I enlarged the perforation by a sweeping semicircular incision through the posterior half of the drum, inserted a drain soaked in

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aluminum acetate one per cent, and ordered hot wet compresses of the same solution. Within twenty-four hours the discharge again became profuse, the temperature fell to 99.4° F., and the fluctuation over the mastoid disappeared, although edema and tenderness were still marked. The treatment was persisted in as just outlined, and within four days the edema and tenderness had entirely disappeared, the discharge lessened, and the drumhead assumed a more normal aspect. Resolution was complete with intact membrane within three weeks.

The second case is that of a child, aged twenty-two months, female, with no history of prior illness except that of a rhinitis of several weeks' duration. I saw her for the first time on January 17, 1917, when the mother stated that about two weeks before she noticed some whitish discharge on the baby's pillow, and a similar discharge from the left ear. There was no blood. She had not noted any discharge since that time, and the amount then was not considerable. During the past week there was a profuse nasal discharge, slightly blood tinged, and at the same time fever, restlessness and swelling over the left temporal and postauricular regions, with prominence of the auricle. Upon examination I found the temperature 102.6° F.; pulse, 140; marked edema over the left temporoparietal region, prominence of the left auricle, which was pushed forward and downward, edema and fluctuation behind the auricle. The auditory canal was not inflamed, the drum was of a delicate pink hue, the short process was easily visible, and there was no bulging. Thorough incision of the drum under anesthesia failed to reveal any pus, but was followed by a moderate flow of dark blood. A cathartic was administered and hot compresses of aluminum acetate one per cent were applied continuously over the auricle and surrounding area, including a drain into the canal. On the following morning the temperature had fallen to normal, there was a profuse discharge from the ear, the fluctuation had disappeared, and the edema was lessened. Within the next forty-eight hours the edema had entirely disappeared and the discharge had moderated. At this time the report of a smear taken on the first day of the discharge was returned, as follows: "Many pus cells, many gram negative diplococci, intra- and extra-

cellular, sometimes occurring in groups. Diagnosis, gonococcus."

On the basis of this report the child had to be removed from the hospital, although a subsequent smear, examined at the same laboratory, stated merely, "gram positive cocci occurring singly and in pairs." The case, however, made an uneventful recovery at home, the discharge ceasing entirely within four weeks.

I am inclined to doubt the accuracy of the report that gonococci were found in this case, inasmuch as the subsequent smear, as well as those taken from the nose, were negative as to this germ. Also, the absence of any possible source of gonococcic infection in the family and environment of the child, as well as the fact that the micrococcus catarrhalis exhibits the same physical aspects as the gonococcus, being differentiated only through culture media and fixation tests, makes the likelihood of this case being gonorrheal remote, although not impossible. Gonorrheal infection of the middle ear was noted in three cases out of one hundred that were examined by Wingrave.[1] Two of the three occurred in infants, ten and twelve months of age, respectively, during the course of acute suppurative otitis media, and were discovered on the fourth and fifth days of the disease. Albert,[2] reporting one hundred and ten cases of acute suppurative otitis media, failed to find gonococci in a single case.

The cure of these two cases of subperiosteal abscess of the mastoid through drainage via paracentesis brings up the subject of the patency of the squamomastoid suture, which was undoubtedly the potent factor. This suture, which marks the junction of squamous with the petrous portions of the mastoid bone, is considered one of the transitory sutures of the skull, and is supposed to be closed by the end of the second year of life. Gruber[3] describes it as a line "which runs from the incisura parietalis over the mastoid to the level of the lower margin of the external auditory meatus, or even lower, and then passes forward, ending in the incisura mastoidea."

The mastoid bone, not being fully developed until puberty, presents interesting phases that have a bearing on infections during childhood.[4 5 6] At birth there is no distinct mastoid There is, however, a mastoid antrum, a space lying posterior

to the tympanic cavity, betwen the petrous and the squamous bones, bounded behind by the mastoid tubercle of the former. The squamous bone sends down a postauricular process which forms the cortex of the antrum and rapidly fuses with the posterior plate of the tympanic bone, which is growing externally to form the posterior wall of the bony auditory canal. They are separated from the petrous portion of the mastoid, which grows outward and downward, by the squamomastoid fissure.[6]

During the course of the second year of life the mastoid becomes fairly distinct, and we now find it consisting of two portions, the anterosuperior or squamous portion, presenting a smooth exterior, and the posteroinferior or mastoid proper, whose surface is rough and irregular. The mastoid cells, which are formed through prolongations from the antrum, are not fully developed until puberty, although occasionally they may be found earlier. Clark[7] reports a case of complete pneumatization at three and a half years.

The patency or persistence of the squamomastoid suture has been investigated by a number of authors, whose statistics are fairly uniform. Thus, Kisselbach[8] found, in fifty-two temporal bones during the first year of life, ninety-six per cent showing the fissure more or less open. During the second year, on twenty-six bones examined, the suture was entirely or partially open in forty-six per cent, and completely closed in fifty-four per cent of the cases. His tables, which follow, show that even up to the age of nineteen the suture may be partially open, and that in a large percentage of skulls examined the suture was indicated by a series of cracks and holes in the bone.

Kirschner[9] examined three hundred skulls of all ages, and found completely open sutures in five per cent of all cases, partially or entirely open sutures on one or both sides of eighteen per cent of all cases.

Kanasugi[10] examined four thousand skulls, with the following results: Three thousand six hundred and twenty-four cases, both sutures closed; two hundred and sixty cases, both sutures partially open; in the remainder there was a partially open suture on one side, with either a completely open or completely closed suture on the other.

KISSELBACH'S TABLE OF PERSISTENCE OF THE FISSURA SQUAMOMASTOIDEA.

Fissura squamomastoidea	Entirely Open	Closed in Middle	Middle and Upper Third Closed	Middle and Lower Third Closed	Upper Third Closed	Middle Alone Closed	Lower End Open	Direction Shown Through Slits and Holes	Closed
1st Year..... (52 temp. bones)	17.3	19.23	13.46	5.77	11.54	....	28.85	....	3.85
2nd Year..... (26 temp. bones)	....	....	19.20	3.80	....	....	23.10	....	53.90
3rd Year..... (46 temp. bones)	4.35	....	....	....	4.35	2.18	29.13	17.39	32.60
4th Year..... (52 temp. bones)	....	....	11.54	....	3.85	7.70	25.00	17.30	34.61
5th Year..... (36 temp. bones)	7.98	....	....	....	5.26	2.63	23.69	13.16	47.38

6th Year..... (32 temp. bones)	....	3.13	....	....	....	6.25	6.25	3.13	81.25
7th Year..... (30 temp. bones)	....	....	6.7	....	13.3	3.3	10.	6.7	60.
8th to 10th Year..... (24 temp. bones)	....	....	8.33	....	....	....	4.17	16.66	70.80
11th to 15th Year..... (20 temp. bones)	10.	....	10.	....	....	10.	3.3	6.7	60.
16th to 19th Year..... (18 temp. bones)	....	....	11.11	....	....	....	....	22.22	66.67

Davida,[11] on the other hand, claims he has never seen a case where the suture was entirely open, although in a series of five hundred skulls he found a more or less persistent evidence of the suture in seventy-four per cent of all bones examined up to the age of fourteen, and in thirty-nine per cent of the adults.

Aderman[12] examined five thousand one hundred and thirty-eight mastoid bones, and found a well developed suture in sixty-four. In eight hundred and forty-five cases the suture was readily recognizable, and in nine hundred and fifty-one others it was present only in traces.

An extreme case is that reported by Brühl, it being a specimen where the squamous bone was entirely separate from the rest of the temporal bone, having never fused.

The evidence thus presented indicates that in early childhood particularly we are likely to find a patent or partially open squamomastoid suture, which, leading directly into the antrum, offers a pathway for infection from the middle ear to the mastoid cortex.[14] [32] Thus the relative frequency of subperiosteal abscesses of this region occurring even in the early stages of an acute suppurative otitis media.

Mygind[15] has shown in an analysis of one hundred cases of acute subperiosteal abscess of the mastoid that seventy-eight per cent occurred during an acute suppurative otitis media, and twenty-five per cent within the first seven days.

Phillips,[30] Dench,[31] Roosa,[25] Turnbull,[26] Ayres,[27] Yamgee,[28] Zytowitsch,[24] all have reported cases of abscess of the mastoid where there were no symptoms referable to the middle ear, and where aural discharge was entirely absent. Furthermore, Brühl[16] has shown that pus may pass from the antrum through the suture without any destruction of the bone tissue.

Another important factor bearing on this subject is the remarkable resistance of the drum membrane in young children as compared to adults. The adult drum consists of very thin cuticular and mucous sheaths enclosing a delicate fibrous structure, the membrana propria. In the child the latter is more heavily developed, and is protected externally by numerous layers of epidermis. Also the inner mucous sheath is much thicker than in the adult, and presents areas thickly studded with villous formed papillæ.[10] This accounts for the cases of

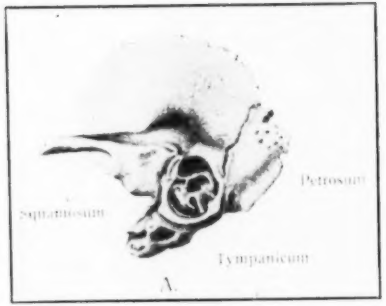

FIGURE 1.

Temporal bone of the newborn.
(Fig. 32. From Traite d'Anatomie. Sappey.)

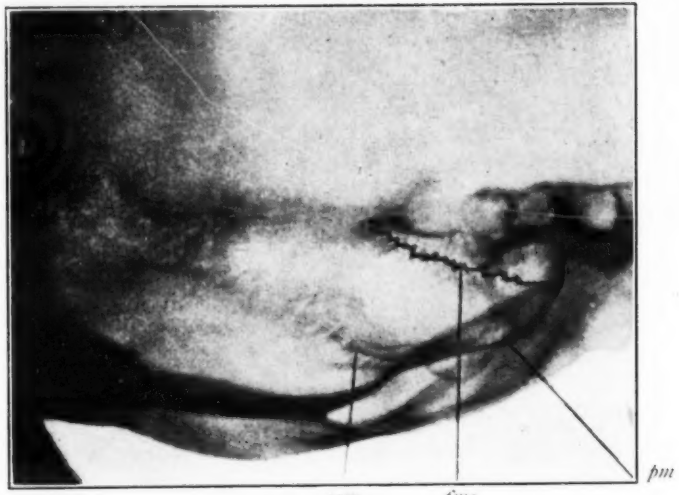

FIGURE 2.

som: Occipitomastoid suture.
fms: Squamomastoid fissure.
pm: Mastoid process.
(From Beitrage zur Pars Mastoidea. Kanasugi.)

advanced middle ear infections where the drum is unruptured presenting no pathology except for a clouding of its surface or a few injected blood vessels. The landmarks may be entirely preserved, as was witnessed in the second case above reported. While it is true that in some cases the infection may drain through the eustachian tube, this avenue is not always open. The comparatively greater width of the tube in infants, while favoring drainage, is more than counterbalanced by its more horizontal situation and the absence or incomplete development of the eustachian cartilage, the pharyngeal orifice presenting a mere slit, which is readily occluded by the slightest nasopharyngeal swelling.

These facts explain the frequent development of subperiosteal abscess of the mastoid in the absence of any marked evidence of middle ear disease, and lead up to a discussion as to the advisability of such treatment as I instituted in my cases, and the safety or danger in delaying the external operation. While the indications for doing a simple mastoid have been exhaustively discussed in various countries, and fairly uniform conclusions arrived at,[18] [19] [20] [21] [22] [23] [24] [29] the question as to the subperiosteal abscess has received less attention, doubtless because of its apparent simplicity. There can be no more universally accepted dictum than that which states the necessity for prompt evacuation of pus wherever it be diagnosed and accessible. But in the case of subperiosteal abscess of the mastoid we may have correlative circumstances wherein conservative treatment may attain the same goal with less danger to the patient than the classical or obvious measures.

We must first take into consideration the relative frequency of such abscesses in young children, the promptness with which they develop, and the anatomic reasons therefor, as indicated above. It being a fact that in over fifty per cent of all children less than two years of age the squamomastoid sutures are more or less patent, is it not reasonable to expect that drainage in the direction of the original focus may be made as effective as the progress of the pus in the opposite directions?[17] In other words, if the squamomastoid suture can transmit pus from the antrum to the cortical periosteum, it can also transmit pus from the mastoid cortex through the antrum into the middle ear. However, the conditions under which this retro-

grade drainage may be attempted are not to be found in all cases, and, therefore, the indications for such measures are limited. It is only in an acute case, where the drum has not been perforated and the middle ear drained, or where the perforation is inadequate, that one may counsel conservatism, and then only with the proviso that there be no other threatening symptoms that would indicate necrosis in the mastoid adjoining other vital structures, such as the lateral sinus, the dura of the middle fossa, or the labyrinth. Furthermore, where drainage through the tympanic membrane has been effected, and the fluctuation and edema of the mastoid fail to promptly disappear, there can be no question as to the necessity of immediate incision into the bone.

In spite of the fact that even spontaneous resolution in mastoiditis has been considered possible, as has been attested to by Politzer,[18] I am inclined to the view of Mygind,[29] who states that a true osteitis of the mastoid cannot heal spontaneously without leaving residues that will be heard from later. However, the cases such as I have described do not come under this heading. Subperiosteal abscess can and does develop without perforation of the mastoid cortex or accompanying osteitis in the manner above described, and it is this type of abscess that will develop in the very earliest days of the otitis media in such cases as have a persistent squamomastoid suture. It is in these cases particularly, where drainage through the middle ear has not been established, and in the absence of any threatening symptoms, that the classic Wilde incision may with safety be deferred until thorough paracentesis and antiphlogistic measures have been instituted.

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XLIX.

FOREIGN BODIES IN THE ESOPHAGUS—AN ANALYSIS OF FIFTY CASES.*

By Stanton A. Friedberg, M. D.,

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The symptoms caused by the presence of a foreign body in the esophagus vary to a great degree. Inasmuch as the accident occurs most frequently in young children, the difficulty of eliciting a definite history is obvious. As is to be expected, the most prominent symptom is the difficulty in swallowing. This may be so slight as to almost pass unnoticed, or, conversely, so marked that even fluids will not pass through the esophagus. In some patients, after the first irritation has subsided, the symptoms almost entirely abate, and doubt may arise as to whether or not a foreign body is present.

In other instances, symptoms persist after the foreign body has been removed or has passed into the stomach. In young children, if the obstruction is at all marked, there is a continual drooling of saliva, with an excess of secretion in the mouth. The child may hold its hand to the neck or incline the head to one side. Shortly after swallowing there is regurgitation of food. In taking the history this is usually improperly called vomiting. In patients in whom an indirect examination can be made, the pyriform fossæ are seen to be filled with secretion. When the esophageal obstruction is marked, this usually amounts to a considerable quantity, and by trickling into the larynx and trachea may excite cough. Large foreign bodies by their pressure on the tracheoesophageal wall produce respiratory disturbances to such an extent as to lead to the suspicion that the foreign body is in the air passages. Pain is intense, according to the nature of the foreign body

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and the local reaction which it has brought about. It may be referred to the seat of the foreign body, to the posterior cervical region, if the latter is high up, or along the vertebral column, if it is in the region of the hiatus. It may be present constantly or only on attempted deglutition. From its location and its interference with swallowing, it is difficult to tell whether the foreign body is located in the upper portion of the esophagus or the pyriform sinus.

The systemic effect of the presence of foreign bodies depends upon their nature, the time they have been present, the amount of obstruction they are causing, and the local changes or reaction they have produced. A careful observation of the temperature will usually show a slight elevation, even in those cases in which the symptoms are few or indefinite The complications that may ensue from their presence are esophagitis, periesophageal abscess, mediastinitis, or ulceration and perforation of the tracheoesophageal wall. The long continued presence of a foreign body will lead eventually to contractures and stricture of the esophagus.

One of the most important aids in diagnosis is the roentgenograph. For large foreign bodies the single picture is satisfactory. For smaller ones, when there is a doubt as to whether the foreign body is in the esophagus or trachea, stereoscopic plates are of greater value. The angle at which pictures are taken is important. I have seen pictures of the same patient made by different roentgenologists in which there was a variation of at least an inch in the apparent location of the foreign body, one plate showing it lower than it actually was. The necessity for having the clothing completely removed from the field cannot be too strongly emphasized. Otherwise, one may spend considerable time looking for an imaginary foreign body. The absence of a shadow does not eliminate the presence of a foreign body. In adults, fish or meat bones high up in the esophagus are almost impossible to interpret on a plate, on account of the impossibility of eliminating areas of ossification in the laryngeal cartilages. Certain types of large buttons, reputed to be made of vegetable ivory, do not give a shadow. The following description will illustrate the above point:

A young child was said to have swallowed a large button. There was considerable difficulty in swallowing. The roentgen-

ogram showed a fair sized button in the region of the hiatus. Esophagoscopy failed to reveal the foreign body. Immediately following the examination another roentgenogram showed that the button had disappeared. Although not quite satisfied that the trouble was over, I allowed the child to go home with instructions as to the necessary observation. The original symptoms persisted, and a few days later the child was returned to the hospital. The second examination showed the button in the usual location, whence it was easily removed. It was of vegetable ivory and did not give a shadow. The button that was visible in the plate, and which I had looked for the first time, was of bone and was attached to the waist.

The question of anesthesia is an important one. While there are not the same contraindications to the use of general anesthesia for work in the esophagus as in the trachea or bronchi, it may be said that this is only occasionally necessary. Cocain may be used quite satisfactorily in adults, but should not be employed in children. In operating the patient should be in the recumbent position. It is well to have the table arranged so that the head can be lowered quickly in case the forceps slips off the foreign body. By doing this we are able to have the benefit of the influence of gravity, the foreign body remaining in the esophagus and not passing into the stomach. Foreign bodies that have lodged in the upper portion of the esophagus may easily traverse the remaining part, if they have been loosened.

The problem connected with the extraction of foreign bodies is almost entirely a mechanical one. It is well to have as definite an idea as possible as to the size and composition of the object that has been swallowed. This may usually be obtained from the patient or parents, or from a careful study of the roentgenogram. A comparison with an object of similar nature is advisable. This was of much value in one patient with a jackstone in the esophagus. Much difficulty was encountered by reason of the forceps repeatedly slipping off one of the prongs. By questioning the mother of the patient it was found that the ends of some of the prongs were smooth while the others were knobbed. By turning the jackstone a knobbed end was seized and the foreign body brought up to the lower border of the cricoid cartilage, where it held. It

was impossible to bring it out without using enough force to bring the cricoid with it. By keeping a firm hold with the forceps and introducing my finger into the mouth of the esophagus, the jackstone was rotated and removed.

Several years later, an infant with a similar foreign body came under my care, and I anticipated having the same difficulty. However, on seizing the foreign body, it came out so easily that I lost it in the mouth. On recovering and examining it, I found that several of the prongs had been greatly worn down and that none of them was knobbed.

In the case of sharp pointed objects, such as common or safety pins, irregular or jagged pieces of bone or metal, extreme caution must be used in order not to perforate or tear the esophagus. One must resist the temptation to seize and remove the foreign body as soon as found, regardless of what damage may be done. It is much better to work slowly and carefully, planning definitely the procedure to be followed, even though another examination may be necessary. When traumatism has resulted from ill advised attempts at removal, the operation is made much more difficult. Inflammatory swelling, edema, transfixion or impaction of the foreign body also add to the difficulties.

The danger attached to the removal of foreign bodies by any other means than under direct vision cannot be too strongly emphasized. The use of probangs or umbrella bougies is rarely justified. With pointed, rough, or jagged obstacles the possibilities for harm are infinite. Even with smooth articles there is considerable danger, as is illustrated by the following instance:

A very young child was admitted to my service at the County Hospital, with a history of having gotten a piece of pig's knuckle in the throat. A physician who was called was unable to remove it, and under the theory of what would not come up must go down, he pushed it, as he thought, into the esophagus. The result was the foreign body went through the esophageal wall, infection was set up and the child was in a serious condition at the time of admission. The bone could be felt in the tissues of the neck and was removed by an external incision. Death resulted from the infection which was present.

I have outlined below an analysis of some fifty cases of foreign body in the esophagus. The following table gives the age of the various patients:

7 months to 1 year	5
1 to 2 years	13
2 to 3 years	6
3 to 4 years	9
4 to 5 years	2
5 to 10 years	4
10 to 15 years	2
15 to 20 years	1
20 to 30 years	2
30 to 40 years	2
40 to 60 years	3
63 years	1
Total	50

The character of the foreign bodies was as follows:

Coins or disc shaped objects	29
Bone	6
Pins	6
Metallic substances	6
Animal matter	2
Marble	1
Total	50

Location of foreign bodies:

Below plica cricopharyngeus	40
Hiatus	4
Above plica	4
Middle third esophagus	2
Total	50

Results:

Dislodged and passed into stomach	2
Partial removal	1
Extraction	47
Total	50

The problems connected with this series of foreign body cases briefly were, first, those with points, in which it was necessary to avoid injuring or perforating the esophageal wall; secondly, those in which there was considerable reaction with impaction of the foreign body; third, one in which the foreign body could not be brought out except by the aid of the finger, on account of its size; and lastly, one in which a stricture had to be dilated before the foreign body could be found. One patient, a child, had two operations, six months apart, for the same kind of a foreign body. Another patient, a hysterical girl, with a pin swallowing habit, was examined four or five times, and altogether about seven pins were removed from the pharynx and hypopharynx. Radiographs showed the presence or absence of pins with such monotonous regularity that our suspicions were at last aroused, and the girl confessed that her accidents were entirely voluntary. The only fatal case was in a child with a coin in the esophagus. There had been considerable traumatism, and death resulted from infection following a tracheoesophageal fistula.

FIFTY CASES OF FOREIGN BODY IN THE ESOPHAGUS[r]

Age	Foreign Body	Location	Anesthetic	Problem	Point of Seizure	Result	Remarks
10 months	Ring.....	Hooked over arytenoid and projecting into mouth of esophagus..	Ether.....	.....	Presenting edge.....	Extraction; cure.....	Symptoms absent.
2 years	Belgian coin.....	Below plica cricopharyngeus, five days....	Ether.....	Unable to locate.....	Presenting edge.....	Extraction; death.....	Marked traumatism. Death from tracheoesophageal fistula.
5 years	Marble....	At hiatus, five days...	Ether.....	Difficulty in grasping...	.....	Extraction; cure.....	
1 year	Penny.....	Below plica cricopharyngeus, one day.....	Ether.....	.....	Presenting edge.....	Extraction; cure.....	
17 months	Penny. ...	Below plica cricopharyngeus, four days....	None.....	.....	Presenting edge.....	Extraction; cure.....	

2 years	Nickel.....	Below plica cricopharyngeus.....	None.....	.....	Presenting edge.....	Extraction; cure.....	
13 months	Penny.....	Below plica cricopharyngeus.....	Ether.....	.....	Presenting edge.....	Extraction; cure.....	
5 years	Whistle....	Below plica cricopharyngeus, four days...	Ether.....	.....	Presenting edge.....	Extraction; cure.....	
30 years	Meat bone	In right pyriform sinus, one day.....	Ether, Cocain...	Marked edema right half of hypopharynx....	Presenting part.....	Extraction; cure.....	Overlooked, on account of edema at first examination.
14 months	Metal toy .	Below plica cricopharyngeus, several days .	Ether.....	.....	.....	Dislodged; passed two days later...	
17 years	Meat bone.	Below plica cricopharyngeus, one day.....	Ether.....	.....	Presenting edge.....	Extraction; cure.....	
3 years	Brass button.....	Below plica cricopharyngeus, two days....	None.....	.....	Presenting edge.....	Extraction; cure.....	

Age	Foreign Body	Location	Anesthetic	Problem	Point of Seizure	Result	Remarks
18 months	Part of watch movement	Below plica cricopharyngeus, one and one-half days	Ether	To avoid tearing wall on account of projecting pinions	At pinion	Extraction; cure	
8½ months	Open safety pin	Below plica cricopharyngeus, four days	Ether	Point up		Extraction; cure	Pin closed with Arrowsmith forceps.
3 years	Nickel, two pennies	Below plica cricopharyngeus, three days	Ether		Presenting edge	Extraction; cure	
2 years	Telephone slug	Below plica cricopharyngeus, seven days	Ether		Presenting edge	Extraction; cure	
20 months	Quarter	Below plica cricopharyngeus, several days	Ether		Presenting edge	Extraction; cure	
19 months	Button	Below plica cricopharyngeus, six days	Ether		Presenting edge	Extraction; cure	

3 years	Telephone slug.....	Below plica cricopharyngeus, two and one-half days.....	None.....	.....	Presenting edge.....	Extraction; cure.....	
19 months	Telephone slug.....	Below plica cricopharyngeus, five days....	None.....	.....	Presenting edge.....	Extraction; cure.....	
2 years	Button....	Below plica cricopharyngeus, thirteen days	None.....	.....	Presenting.. edge.....	Extraction; cure.....	
7 months	Open safety pin....	Below plica cricopharyngeus, several days .	None.....	Point up.....	.....	Extraction; cure.....	Pin closed with Arrowsmith forceps.
48 years	Chicken bone.....	Hiatus, three days....	Cocain....	Transfixed. Rotation ...	Grasped near end and withdrawn...	Extraction; cure.....	
3 years	Two pennies.....	Below plica cricopharyngeus, thirteen days	None.....	.....	Presenting edge.....	Extraction; cure.....	
16 months	Metal toy goat.....	Below plica cricopharyngeus, three days...	None.....	Rotation.....	Head.....	Extraction; cure.....	

Age	Foreign Body	Location	Anesthetic	Problem	Point of Seizure	Result	Remarks
48 years	Part of fish fin.....	Above bronchial crossing, one day.....	Cocain....	Impaction...	Presenting edge.....	Extraction; cure.....	
26 years	Picture button....	Below plica cricopharyngeus, three hours..	Cocain....	Pin portion partly open. Rotation ...	Presenting edge.....	Extraction; cure.....	
2 years	Button....	Below plica cricopharyngeus, four and one-half months.....	None.....	.....	Presenting edge.....	Extraction; cure.....	Symptoms respiratory. Diffuse bronchitis.
7 months	Open safety pin....	Middle third of esophagus, seven days.....	None.....	Point down closed by drawing into tube.....	Ring portion.	Extraction; cure.....	
4 years	Iron washer.....	Middle third of esophagus., a number of months.....	Ether.....	Dilatation of stricture before foreign body could be found.....	Presenting edge.....	Extraction	

3 years	Jackstone	Below plica cricopharyngeus, four hours...	None.....	Rotation to grasp knobbed prong...	At knobbed prong.....	Extraction; cure.....	Could not be pulled above cricoid. Held with forceps and delivered by rotating with finger.
11 years	Pins.....	In hypopharynx.....	Cocain....	Hysteria....	.....	Extraction; cure.....	Several operations performed.
6 years	Nickel.....	Below plica cricopharyngeus.....	None.....	.....	Presenting edge.....	Extraction; cure.....	
2½ years	Penny.....	Below plica cricopharungeus, two weeks...	None.....	.....	Presenting edge.....	Extraction; cure.....	
17 months	Collar button, hinged	Below plica cricopharyngeus, 10 hours.....	None.....	.....	Presenting edge.....	Extraction; cure.....	
14 months	Tin button	Below plica cricopharyngeus, four weeks...	None.....	.....	Presenting edge.....	Extraction; cure.....	
3 years	Penny.....	Below plica cricopharyngeus, four days...	None.....	.....	Presenting edge.....	Extraction; cure.....	

Age	Foreign Body	Location	Anesthetic	Problem	Point of Seizure	Result	Remarks
13 months	Jackstone..	Below plica cricopharyngeus, seven days ..	None.....	.....	At prong.....	Extraction; cure.....	
41 years	Meat bone	Below plica cricopharyngeus, two days....	Cocain....	Impacted, rotation on account of sharp prolongation...	.....	Extraction; cure.....	
27 years	Half dollar	Hiatus, thirty-two hrs.	Cocain....	Impaction...	Presenting edge.....	Extraction; cure.....	
7 years	Nickel....	Below plica cricopharyngeus, one day.....	None.....	.....	Presenting edge.....	Extraction; cure.....	
16 months	Meat button.....	Below plica cricopharyngeus, two days....	None.....	.....	.....	Extraction; meat button dislodged, passed later.	
10 months	Open safety pin....	Below plica cricopharyngeus.....	None.....	Point up ...	Grasped at point and withdrawn...	Extraction; cure.....	

35 years	Bone.....	Hiatus.....	Cocain....	Transfixed...	Grasped and drawn upward. Slipped off forceps.....	Dislodged, passed into stomach....	
4 years	Quarter....	Below plica cricopharyngeus, two and one-half days.....	None.....	Impacted....	Presenting edge.....	Extraction; cure.....	
3½ years	Nickel.....	Below plica cricopharyngeus, one day.....	None.....	.....	Presenting edge.....	Extraction; cure.....	
62 years	Meat.....	Below plica cricopharyngeus, three days...	Cocain....	Impacted, friable.....	.....	Extraction; cure.....	
12 years	Pin.....	Above plica, two days.	Cocain....	Point in tissues.....	At head.....	Extraction; cure.....	
3½ years	Penny.....	Below plica cricopharyngeus, two and one-half days.....	None.....	.....	Presenting edge.....	Extraction; cure.....	Six months before had similar accident.
3 years	Pearl button.....	Below plica cricopharyngeus, six hours....	None.....	.....	Presenting edge.....	Extraction; cure.....	

L.

REPORT OF A CASE OF NASAL SARCOMA CURED BY RADIUM.*

By Otto J. Stein, M. D.,

Chicago.

F. L., aged twenty years, presented himself July 2, 1916, complaining of complete nasal obstruction, profuse attacks of epistaxis and severe headaches.

Examination revealed the following: A young man, tall, dark complexion, anemic, poorly nourished, mouth breather, right eye protruding so that the lids could not cover the ball, anterior nares excoriated from nasal discharge, nasal bridge widened and tissues round about thickened, altogether giving the frog-like facies. Right nostril was entirely blocked by a pale colored, fairly hard mass, excepting in spots where there was local necrosis showing areas of sloughing surrounded by hemorrhagic oozing. The tissue bled freely on manipulation, and especially so on application of adrenalin. As far as could be determined, the tumor seemed to originate from the right ethmoid region. The septum was intact and with no adhesions between it and the tumor. The left nostril was not invaded, being open. The nasopharynx was entirely filled by the tumor plugging both posterior nares. A probe introduced into the left or open nostril could be passed around the mass in the epipharynx. Bleeding always resulted from such instrumentation. The patient suffered acutely from constant headache and the attacks of epistaxis. The right sinuses showed dark on transillumination. The skiagraph demonstrated shadows in the region of the right antrum, ethmoid and nostril.

*Read before the Chicago Laryngological and Otological Society, April 17, 1917.

Examination of the eye by Dr. George Suker revealed optic nerve atrophy, no swelling of discs, veins some tortuous, arteries likewise, disc edges blurred and adjacent retinal area shows grayish cast. Has a large and painful mass of cervical lymph gland on left side of neck; scar shows incision of former years. No family history of malignancy, no cough, no other evidences of pulmonary tuberculosis. Wassermann negative. Nasal obstruction came on gradually some months before presenting himself. A diagnosis of sarcoma was made from the patient's age, the history, general appearance and local findings. This was confirmed by microscopic examination of tissue removed, which showed small round cell sarcoma.

On our refusal to operate the patient disappeared. Presenting himself at the County Hospital, an attempt was made to remove the tumor by way of the anterior nares. The hemorrhage was severe. An infection resulted, necessitating an external incision over right malar region to liberate pus. Sections of the tumor removed demonstrated round cell sarcoma. After six weeks the patient again presented himself to us for relief. His appearance was similar to what it was when first seen, only his condition was worse. He did not look as if he could live much longer, being very weak and anemic, and on account of pain in his head had little rest day or night excepting what he got from sedatives. He was immediately placed on radium treatment. One hundred milligrams of radium was applied uninterruptedly for five hours on three consecutive days. Nineteen days later this was repeated, excepting that it was continued for six hours each day. Thirty days later fifty milligrams was applied for four hours, and sixty days later fifty milligrams was applied on two consecutive days for six hours each. In addition, radium was applied to the large painful gland mass on left side of neck. A total of forty-one hundred milligram hours of radium was used about the nose and twenty-one hundred and twenty-five milligram hours of radium was applied to the enlarged glands. The details of the radium treatment is appended, kindly compiled for me by Dr. Albert Woefel of the Physicians' Radium Association, who furnished the radium used.

RADIUM TREATMENTS OF CASE OF SARCOMA OF NOSE

Dates	Dose	Screen	Exposure	Position	Mgm.Hrs.
Sept. 25, 26, 27.	50 mg.	1 mm., lead-black paper and rubber.	5 hours. .	Rt. post. nares..	750
Oct. 16, 17, 18..	50 mg	1 mm. plat. and rubber	6 hours each. . . .	Rt. post. nares..	900
Nov. 21.	50.	1 mm. plat. and rubber	4 hours..	Rt. post. nares..	200
Jan. 23, 25.	50.	1 mm. plat. and rubber	6 hours each. . . .	Rt. post. nares..	600
					2450
Sept. 25, 26, 27..	25 and 25. .	2 mm. lead and rubber.	5 hours each. . . .	Varying positions around orbit.	750
Oct. 16, 17, 18..	25 and 25...	2 mm. lead and rubber.	6 hours each. . . .	In V-shaped position on temporal side of right orbit. . . .	900
					1650

Nov. 14.....	50 and 50 and 25 mg.	2 mm. lead and rubber	6 hours.	On left cervical glands.....	750
Nov. 16.....	50 mg.....	2 mm. lead and rubber.	10 hours.	On left cervical glands.....	500
Nov. 17.....	50 and 25 mg.....	2 mm. lead and rubber.	6 hours.	On left cervical glands.....	450
					1700
Jan. 23.....	25 mg. (flat).....	1.5 mm. lead and rubber.....	4½ hours	On upper part of neck.....	112
Jan. 25.....	25 mg. (flat).....	1.5 mm. lead and rubber.....	6½ hours	On upper part of neck.....	163
Jan. 27.....	25 mg. (flat).....	1.5 mm. lead and rubber.....	6 hours.	On neck.....	150
					425

In employing the remedy the object was to use large doses over a medium period of time, correctly screened and properly applied within the nose and on the face to secure the greatest benefit from cross firing. The immediate results from this treatment were brilliant. All of the severe pain and the nasal hemorrhage disappeared before a week went by. A week later he was breathing through his left nostril, and some air could be detected passing through on the tumor side or right nostril. Three months later respiration through both nostrils was normal, and he could blow nostrils naturally. Inspection showed the progressive shrinking of the tumor and disappearance of all ulcerations. The rhinoscope demonstrated the tumor springing from the posterior ethmoid region. This would explain the appearance and changes about the right eye —namely, exophthalmus, nerve atrophy, tortuous veins, etc. The optic nerve and vessels are more vulnerable in the neighborhood of the sphenoid sinuses; but where a posterior ethmoid cell occupies this relative position, then the nerve becomes correspondingly more susceptible from this source. From various anatomic studies this relationship of the posterior ethmoid cell to the nerve occurs in a small per cent of cases. Meckel's ganglion, the source of sensory impressions in and about the nose, orbit and sinuses, nestles in the sphenomaxillary fossæ, just below the posterior ethmoid cell and in front of the sphenoid and back of the apex of the antrum of Highmore. A tumor in this region can produce severe pain corresponding to that complained of by the patient.

On last examination of the patient no evidence of tumor could be seen within the nose or nasopharynx, although I believed some still existed within the ethmoid labyrinth. Three weeks after seing him last he was reported as being confined to bed at home with a temperature, pain in abdomen, nausea, constipation, tympanitis, and a cutaneous eruption over left half of face. Not being able to visit him, he was directed to be sent to the hospital for examination. Disregarding this request, he remained at home, under the care of his family physician, who reported to me a few days later that the patient was suffering from metastasis and that the malignancy was manifesting itself in the intestines, causing severe pain, tympanitis, vomiting, and great weakness. It was stated that

he would not survive this serious sequela. It was further stated that, aside from a cutaneous eruption on the left side of face, the patient had no symptoms whatsoever referable to his head.

After ten days of illness he died. A request for an autopsy was made and granted. I opened and examined the head. Dr. McKerrihan of the Postgraduate Hospital examined the abdomen. After removing the calvarium and brain, exposing the interior of the base of the skull, examination showed no invasion. The entire tegmen of the right orbit, frontal sinuses and nasal fossæ was removed, exposing the interior of these respective cavities, which showed neither the presence of or any evidences of their invasion. The antrum and sphenoid were likewise free. The posterior ethmoid cavity was large, extending far backward, and overlying in part the neighboring sphenoid cell, which was very small. The lining membrane appeared greatly hypertrophied, the optic nerve course was alongside the cell. The middle turbinate was not present excepting a small bit posteriorly. The anterior ethmoid cells had been broken down by previous operation. No tumor could be found anywhere. These findings affirm the previous statement that the tumor had its orgin in the right ethmoid region, and owing to the anatomic arrangement present, the nerves and vessels were subject to pressure. As far as the head was concerned, the patient was cured of his sarcoma.

The examination of the contents of the abdominal cavity disclosed, aside from a distended gall bladder, a perforated appendix lying in a bed of pus and exudate. Neither within nor upon the surface of the body was found evidence of metastasis. The eruption on the face was herpetic, toxic in origin, and an early manifestation of an infection that was overlooked. The patient most unfortunately came to an untimely death as the result of peritonitis caused by perforating appendicitis.

LI.

PERISINUS ABSCESS WITH APPARENTLY NORMAL SINUS, FOLLOWED BY EXTENSIVE THROMBOSIS WITH MULTIPLE METASTATIC ABSCESSES. REMOVAL OF CLOT FROM SINUS AND BULBUS. JUGULECTOMY—RECOVERY.

By Otto Glogau, M. D.,

New York City.

On February 27, 1916, I was called by Dr. H. Fried to see H. N., sixteen years of age. On February 19th the patient had been taken sick with la grippe. The following day, without much preceding pain, the left ear started to discharge. Two days afterwards severe pains over the mastoid process set in and continued to the date of examination. The ear had been discharging freely, the temperature being around 102°.

Local inspection revealed a perforation in the posterior lower quadrant of the drum membrane with free drainage. The posterior upper canal wall was slightly sagging. Severe pressure pains over the tip of the mastoid process and over the antrum region were present. The upper and posterior aspect of the mastoid bone were not sensitive. Temperature, 103°. The patient was advised to go to the hospital for observation and probably operation. I did not hear from the patient till March 2d, when I was called again to see him. The sensitiveness had extended over the entire mastoid bone, being especially severe at the tip and the posterior border. The canal wall was bulging forward to a marked degree, and there was free and copious discharge from the ear. Temperature, 103°. No redness or swelling behind the ear. The patient was then removed to the Philanthropine Hospital and immediately operated upon.

After the usual semilunar incision and retraction of the

periosteum, the mastoid bone was exposed and showed a livid discoloration. After chiseling open the very thin cortex, the entire mastoid cavity proved to be destroyed and filled out with necrotic granulation tissue and pus. There was a perisinus abscess which had destroyed the bony wall of the sigmoid sinus to the extent of two centimeters. The sinus wall, both as to color and touch, appeared normal; pulsation was clearly noticeable. The antrum was found to be necrotic, but no probe could be introduced into the aditus. The middle ear had apparently been separated from the mastoid process by proliferation around the antrum. The antrum was curetted and a communication established with the middle ear. The upper part of the wound was closed by skin and periosteal sutures, the wound cavity filled with gauze strips. The pus from the mastoid wound contained streptococci.

The following day the temperature rose to above 105° and dropped within a few hours to 102°. During the next few days one or more such fluctuations occurred during twenty-four hours. On the third day after the operation the rise of the temperature to 105.6° was preceded by a chill and followed by exhaustive sweating. A blood culture was taken and no streptococcemia was found. The pulse rate varied between seventy-four and one hundred and twenty-eight, but was mostly around one hundred. There were severe pains on the affected side of the head; mostly referred to the mastoid region. The diagnosis of thrombosis of the sigmoid sinus was made, and immediate removal of the thrombus advised. Dr. S. Oppenheimer, in consultation, agreed with the diagnosis, and also advised immediate operation.

The operation was performed on March 10, 1917. After thorough sterilization of the head and neck, the mastoid wound was reopened.

The sigmoid sinus was exposed to the extent of three centimeters. The sinus was found to be inflamed, of dark grayish color, and its wall very much thickened. No pulsation could be felt. A piece of gauze was pressed by the assistant against each end of the exposed sinus, while its wall was slit open by means of a curved and pointed bistoury. No bleeding took place from either portion of the sinus. The sinus was filled out by a rather soft clot of dark grayish color.

In order to avoid the dislodging of particles of the clot into the general circulation, I decided to ligate the jugular vein prior to curetting the sinus. The mastoid wound was temporarily closed with iodoform gauze. The incision in the neck was begun at a point of the anterior margin of the sternocleidomastoid muscle, horizontally posterior to the angle of the jaw, and continued downward parallel to the margin of the muscle for two inches. The jugular vein was exposed in the regular way, after opening the common sheath of the vessels. The vein was found to be a solid mass of the diameter of a small finger, of dark grayish color. As the thrombosed portion seemed to extend further down, the vein was exposed to the clavicle and found to be thrombosed to that distance. The internal jugular vein was then separated from the pneumogastric nerve and the carotid artery by means of a dull dissector, and a double catgut ligature was passed above the entrance of the facial vein and another one at the lower end of the thrombosed portion of the vein between the two sets of ligatures excised. A number of cervical glands, enlarged, inflamed and apparently infected, were also removed. I pass around the specimen of the excised portion of the thrombosed vein.

The gauze from the mastoid wound was then removed and the incision prolonged to meet the one on the neck. The sinus was then curetted in the direction of the bulb. Masses of decaying clot tissues were thus removed, but no bleeding occurred. More and more bone tissue had to be removed in the direction of the jugular fossa, and still no bleeding occurred upon removing the clot by means of the curette. I then proceeded, according to the method of Grunert, with dull dissection into the depth, till the external bony margin of the jugular foramen was reached. The bony bridge between the latter and the previously exposed lowermost end of the sigmoid sinus was then carefully chiseled away. The bulb of the vein became thus accessible to the knife, and the incision from the lower end of the sigmoid sinus was thus prolonged over the bulb into the internal jugular vein. After the removal of all thrombosed masses the formerly closed vascular system consisted of a groove open to the outside with its inner wall consisting of the slit open wall of the sigmoid sinus, bulb and internal jugular vein. In order to expose the torcular end of

the sigmoid sinus, an incision was made vertically to the semilunar over the mastoid, and the tissues retracted. The bone had to be removed for one more inch backward before the curetting of the sinus resulted in free bleeding from its torcular end. The entire wound was then flushed with normal saline solution, the edges of the sinus wall pressed inward by gauze strips, the mastoid cavity filled with gauze packing and closed at its upper portion. A cigarette drain was inserted into the jugular wound in its entire length and the incision closed, the drain protruding near the clavicular and the mastoid end of the incision. The temperature after the operation remained septic for over a week; the temperature, however, would daily rise less high and gradually drop lower.

On the fifth day after the operation a metastatic abscess, in the region of the buttocks, on the left side, was noticeable. The next day a few ounces of pus were evacuated, the cavity was curetted and packed with iodoform gauze. Two days afterwards another metastatic abscess was detected at the occipital region of the scalp, and treated in a similar way. Two days later a swelling around the thyroid portion of the larynx was noticed, which soon started to fluctuate. Upon incision two ounces of pus were evacuated. The patient had suffered from choking sensations, lack of air, and pains in swallowing, which were relieved by the evacuation of the pus. While the other two metastatic abscesses healed within a short time, the metastatic abscess around the larynx suppurated for four more weeks. Due to the excision of the internal jugular vein, the left side of the neck and face was swollen for a short time. The mastoid and jugular wound were frequently dressed. The patient made an uneventful recovery, and the external wounds closed entirely within two months after the operation. Subsequent bacteriologic examinations of the blood, during the formation of the metastatic abscesses, at no time revealed streptococcemia.

The case offers the following interesting features:

Perisinus abscess with apparently normal sinus wall at the primary mastoid operaion. Septic fever curve, characteristic of sinus thrombosis, with negative blood cultures, although the pus from the mastoid shows pure streptococci. Thrombosis of entire internal jugular vein and inflammatory hypertrophy

of the cervical lymph glands, without any changes around the neck pointing to this condition.

The thrombosis of the jugular vein was practically only detected while its ligation, prior to the curetting of the thrombosed sinus, was undertaken. The question whether or not the jugular vein shall be ligated before curetting a thrombosed sinus has not been settled as yet. The findings of this case are, however, very suggestive of the exposure and inspection of the jugular vein, even in those cases where the appearance of the thrombus within the sigmoid sinus does not imperatively demand the ligation of the vein.

LII.

SUSPENSION LARYNGOSCOPY.*

By H. L. Pollock, M. D.,

Chicago.

When one presents a paper before a society like ours there are certain conditions which are to be met. They consist in (1) presenting something entirely new or original, either in subject matter, technic or instruments; (2) an improvement or modification of something already presented; (3) a résumé with conclusions drawn therefrom, and (4) an emphasis of a well known condition by presenting it from time to time and adding something new, either favorable or unfavorable, to that which is already established.

My object in discussing suspension laryngoscopy is not to add anything materially to the technic, nor have I many new instruments or appliances, but simply to call your attention to the fact that this method has been very much neglected in the hands of the otolaryngologist through this country. When one considers the great advantages, either diagnostic, medical or surgical, this method of doing intralaryngeal work has over the indirect method, it is scarcely conceivable that so few laryngologists are familiar with the technic which is so easily performed with such simple apparatus and instruments. That this is true is evidenced by the large number of visitors at our clinic at the North Chicago Hospital, who for the first time have witnessed suspension laryngoscopy.

In 1915 my associate, Dr. Joseph C. Beck, read a paper before this society, giving our experience in over two hundred cases where suspension had been employed. Since that time we have had many more interesting cases, and have met some new conditions. The histories and course of some of these I will give later.

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*Read before the Chicago Laryngological and Otological Society, May 22, 1917.

At that time he cited several conditions in which suspension was impossible, but since then Dr. Lynch and others have greatly improved the technic, and some of these objections and difficulties have been overcome. In the beginning, excepting a few cases of anatomic or pathologic changes, such as a tumor at the base of the tongue or the epiglottis, ankylosis of the jaws, etc., our greatest difficulty was in those cases where there were no teeth in the upper jaw, or only a few fangs, or where the teeth had been loosened by pyorrhea. Since employing Lynch's modeling compound aluminum plate, this difficulty has to a greater extent been done away with.

The advantages which this method possesses over the indirect, except in the routine office practice, in diagnosis and treatment is so marked that it would be a waste of time to begin to enumerate them, and the disadvantages are comparatively so few that they are scarcely worth mentioning. In adults, for a routine superficial laryngeal examination, the indirect method usually answers the purpose, but we have had cases where, notwithstanding perfect cocainization, an examination was impossible. In children and infants, however, direct examination is impossible, except under general anesthesia. To be sure, suspension laryngoscopy is quite a formidable procedure, if we consider the time required and the amount of cocain employed, but the results in those where it is indicated justifies our endeavors, and one feels fully recompensed for the time spent by the favorable results obtained.

The indications for the use of suspension are about the same as those described in Dr. Joseph C. Beck's paper, which are as follows:

1. Carcinoma.
2. Adenocarcinoma.
3. Papilloma.
4. Fibroma.
5. Angioma.
6. Syphilis.
7. Tuberculosis.
8. Rhinoscleroma.
9. Cicatricial stenosis.

10. Paralysis.
11. Foreign bodies.
12. Burns.
13. Asthma.
14. Posttraumatic tracheal stenosis.
15. Bronchiectasis.
16. Suction of secretion for bacteriologic examination.
17. Direct intubation.
18. Simple laryngitis.
19. Posttyphoidal chondritis.
20. Atrophic laryngotracheitis.
21. Hysteric aphonia.
22. Suspected thymus enlargement.
23. Tracheal compression by thyroid enlargement.
24. Aortic aneurism.
25. Normal cases.

During the past eighteen months we have not had a single case in which suspension, either under local or general anesthesia, could not be successfully performed. There was one case, however, which I will mention later, in which suspension was very easy but the tumor could not be reached; the reason therefor will also be explained.

As stated before, general anesthesia is necessary in children and infants, and this is given either by the blowing vapor method through the mouth or through the tracheotomy tube, if such was previously necessary. In practically all the adults local anesthesia sufficed, but just recently we had one case where, notwithstanding a perfect local anesthesia, suspension could not be performed, and a general anesthesia was resorted to. This was no doubt due to psychic conditions. The patient was a young man, seventeen years of age, on whom a previous unsuccessful attempt at suspension had been made by another laryngologist.

In some of our earlier cases we had great difficulty in suspending patients on the first attempt, due to gagging and irritability. We explained that it was necessary to get the patient trained to this procedure, but now this seldom occurs. This is probably due to the fact that in all our earlier cases we used twenty per cent cocain for anesthesia, but recently we are

using the pure flakes. The cotton-wound applicators are moistened by dipping them into the adrenalin and then into the pure flakes, then the application is made to the mucous membrane of the back of the tongue, pharynx and larynx, thereby obtaining a perfect anesthesia and muscular relaxation. We have no hesitancy in employing sufficient cocain to obtain the desired results; in some cases as much as four grains are used, and up to the present time we have never seen the slightest toxic results.

The apparatus which we employ is very simple and the instruments few. It is surprising how easily it can be accomplished with a simple outfit. An ordinary surgical table of any description that can be raised and lowered is suitable for attachment of the crane. Of course, the new table of Lynch's is preferable. The crane which was first devised by Killian is used, and we feel it answers the purpose satisfactorily. In the beginning, while using either the original Killian handle and spatulas or the modification of Albrecht's, we experienced great difficulty in keeping the tongue from slipping to one side, or the epiglottis slipping away from the spatula and thus obstructing the view of the larynx. Since using Lynch's modification these difficulties have all been practically overcome.

There still remained one great difficulty in this work, and that is where we desire to reach the vallecular region or to do actual work on the epiglottis. As all the spatulas with which I am familiar cover this area, I have suggested one which I believe will do away with this difficulty. It is a modification of a spatula, in which the tip is cut out in a crescent shape and the points reach well towards the pyriform fossæ, thus allowing the center portion to be free and permitting direct approach to the epiglottis and center of base of tongue.

A Cordes punch biting forceps, with its several sized tips, a Killian alligator bronchoscopic forceps, a long handled curette, and a few applicators for wiping way the little oozing, completes our list of instruments.

Probably the most frequent use of the instruments is for examination and removal of microscopic specimens in suspected malignant disease. Under suspension one can see the entire larynx exposed, and can study the limitation of the

growth and very easily remove a portion for microscopic examination.

Owing to the fact that carcinoma cells are sometimes implanted in neighboring healthy tissues by cutting or snaring away some of the tumor, Bloodgood has recently called attention to the method of using a cautery needle by which he surrounds the specimen to be removed, thus believing he prevents an implantation in surrounding healthy tissue. As this needle is impossible to use in the larynx, I have suggested a specially long handled cautery knife, by which I cauterize an area completely around the specimen to be removed and thus obviate this danger of implantation, and the specimen can then be removed with impunity. So far as the interior of the larynx is concerned, the danger of implantation is not so great, owing to the fact that it is within a cartilage box.

Next in importance is the removal of the nonmalignant tumors of the larynx, especially the cords—viz., papilloma, fibroma, angioma, and polypi. It is a very easy matter to remove the tumor which presents itself in prominent view with a Cordes biting forceps. If the growth is situated at the extreme anterior commissure, it is sometimes necessary to use counter pressure externally, and this can either be done by an assistant or one can employ the left hand and thus easily bring the growth into view. In tubercular ulcerative laryngitis where actual cautery is indicated, or an application of trichloracetic acid is necessary, this can be done easily and far more accurately than when using the indirect method.

In fact, all of the conditions enumerated before can be done so much more satisfactorily than by the indirect method.

CASE REPORTS.

Case 1.—Master W., aged seventeen years. Patient has been complaining of hoarseness for the past two years, condition gradually becoming more pronounced, until now he can scarcely speak above a whisper. Has also had slight difficulty in breathing during the past two or three months. Family history negative as to lues and tuberculosis.

This is a case that I mentioned in which, although perfect cocainization was done, it was impossible to suspend the pa-

tient without a general anesthetic. He was referred by a laryngologist who stated that it was impossible by the indirect method to obtain the slightest view of the interior of the larynx. An attempt was made to suspend patient under local anesthesia by the same laryngologist, but it was unsuccessful. The young man was extremely nervous and greatly feared another attempt of suspension. Notwithstanding his fears, we attempted to suspend him, but it was impossible on account of the incessant gagging and struggling. Immediately he was placed under ether anesthesia, and there was not the slightest difficulty in suspending him satisfactorily.

Examination showed a large papilloma situated at the anterior commissure. This was easily removed with the Cordes punch. As soon as the patient recovered from the anesthesia the voice was almost normal and gradually improved until at the end of the fifth day phonation as well as breathing was perfect. I then attempted to obtain a view by indirect examination, but this was impossible. Wishing to see the larynx again, I made another attempt to suspend under local anesthesia, but found it absolutely impossible for the reasons described above. Microscopic examination showed the growth to be a true papilloma.

Case 2.—Mr. H. M. K., aged forty-four years, referred to us by a laryngologist from Fort Wayne, Indiana, with the following history:

Patient an inveterate cigarette smoker, but having had no illness of any consequence since childhood. He denies a luetic history. About one year ago the throat began to bother him; first noticed hoarseness, which increased, and was finally accompanied by slight pain and discomfort. Described the throat as feeling swollen. Was seen by a laryngologist in November, 1916. At that time he presented a congested condition of all the mucous membrane of the pharynx and larynx, and there was an active ulceration of the epiglottis and the left side of the larynx. The cord on the left side presents marked thickening and roughness along the free border. He gave a positive Wassermann, and the family physician was advised to give salvarsan intravenously and follow up with mercurial inunctions, and potassium iodid in doses of seventy-five to

one hundred grains, three times per day. This was not done, as near as the laryngologist could ascertain; in fact, he believed the patient did not receive the salvarsan injection. Finally, the laryngologist gave him mercurials and iodids with a marked improvement in the general condition of the throat. Quite recently, however, the throat took on the appearance that it had when referred to us. A piece of tissue was removed for microscopic examination, but report was not obtained at the time he was sent to us. It was the belief that the original lesion was specific, as it had all the earmarks of the same.

Under local anesthesia the patient was suspended, and from the left arytenoid to the right, toward the epiglottis, there was a large mass causing a stiffening of the epiglottis. The entire left side was fixed. Three large pieces of the growth were removed for microscopic examination, and the same proved it to be a rapidly growing carcinoma. As there was no metastasis in the cervical glands, a laryngectomy was advised. The patient returned home and has not been seen nor heard from since.

Case 3.—Miss Hln., aged twenty-nine years. Referred by a laryngologist from Indianapolis. Has complained of hoarseness for several months. A diagnosis of a tumor mass on right cord was made by this laryngologist, and three unsuccessful attempts were made by the indirect method.

Upon examination I found a small apparently firm mass on the right cord near the anterior commissure. The patient was very nervous and feared the ordeal of a suspension, but after thorough cocainization she was suspended without any difficulty, and the entire growth was removed very easily. The patient did not have the slightest ill effect whatsoever. Her voice cleared up, and I have heard since that she is in very good voice.

Case 4.—Master P., aged five years. Referred by a laryngologist on account of hoarseness and difficulty in breathing. Wearing a tracheotomy tube. When patient was one year old, the parents noticed that his voice was quite husky; this condition gradually grew worse until he was three years of age, when his voice was completely gone. Consulted a physician, who did a laryngotomy and removed a growth from the

larynx. Voice did not clear up and the difficulty in breathing continued. Two weeks later he was returned to the hospital and again operated, removing some more tissue. This time patient had so much difficulty in breathing that a tracheotomy was performed and tube inserted. One year later consulted another physician, a laryngologist, who, after several attempts to examine the larynx, was unable to do so, and referred the patient to us. Examination shows papilloma extending completely around tracheal opening. The tracheotomy tube which he is now wearing has not been removed from trachea for one year.

On April 6th, under general anesthesia, patient was suspended and a large papillomatous growth was removed; this was situated just below the epiglottis. One-half of the external papillomatous growth around the tube was also removed. Child improved some, but on April 19, 1917, under general anesthesia, he was again suspended and the remaining half of the papilloma was removed and the interior of the larynx curetted. Small rubber catheter passed through laryngeal opening and out the mouth. This was left in situ to act as a guide in introducing the intubation tube on the following day, and then removed. Voice gradually improved, and the opening in the neck is gradually closing. The tube has now been left out for a whole week, and breathing is very good. We are gradually training him to use his voice.

Case 6.—Baby Smith. First seen May 20, 1915, aged three years. Complains of hoarseness and difficulty in breathing since she was five months old. Condition came on after a severe cold. Began to gradually lose her voice. This condition of her throat also interferes with eating. Healthy child otherwise. About one year ago was threatened with pneumonia, at which time had very labored breathing.

Examination showed a smooth neoplasm in the posterior commissure, anterior half of cords plainly seen, though quite red. Digital examination showed smooth round growth in posterior right laryngeal region.

May 24, 1915, under ether anesthesia, open drop method, a tracheotomy was performed. Trachea found to be small and easily collapsible. Suspension was applied, and from the

posterior portion of the larynx a papillomatous growth was removed. Condition cleared up and patient returned home.

May 1, 1916, returned on account of recurrence of husky voice and difficulty in breathing. Under general anesthesia under suspension a small piece of papillomatous tissue was removed. The growth seemed very thin.

May 18th, under general anesthesia, an intubation tube was passed into the larynx of the patient, after the method of Iglauer, with a great deal of difficulty and serious symptoms of collapse upon the part of the patient, which required an emergency enlargement of tracheotomy wound and insertion of tube. The child was so bad—that is, breathing so labored —that the attention of a physician was required, and she was thought to have bronchopneumonia and was unable to take any liquid by mouth. Intubation tube was removed and tracheotomy tube reinserted, and patient had relief.

May 25th, patient well, pneumonia cleared up, and upon examination found that when the tracheotomy tube is closed up patient is able to enunciate a number of spoken words.

June 7th, patient was again placed under general anesthesia and both tonsils were removed, followed by an uneventful recovery.

June 10th, reentered hospital to have tracheotomy tube removed under observation. The fright was so great on the part of the patient that the attempt was given up.

June 22nd, tube removed and watched all day; nothing happened, and she got along very well. Tracheal opening healed over very nicely.

June 29th, patient left for home. Opening entirely healed.

On March 17, 1917, we received a letter from her father, stating that her voice is just as strong as any other child's, and she is talking all the time.

Case 7.—Mr. Msh., forty-six years old. Referred by laryngologist with the following history: One year ago, while in Mexico City, during the revolution, was frightened by an attack on his business, and in a fit of despondency he attempted to commit suicide by cutting his throat with a razor. Shortly after that was taken care of and the wound healed. He left Mexico and went to California, and while there noticed that

his voice was gradually getting hoarse, and had some difficulty in breathing. A growth was removed from the larynx at that time by the indirect method. Some time later, however, this condition recurred, and this time he was suspended and another growth removed, which he informed us had been microscopically examined, and was granuloma.

September 13, 1916, patient first consulted us, and by indirect examination a smooth looking, subglottic, sesile growth was seen. Cords looked normal.

September 18th, under suspension, local anesthesia, this soft growth was removed with the Killian short alligator forceps. Subsequently curetted and cauterized the base with a twenty per cent solution of silver nitrate.

September 27th, throat looks good. Breathes well. Microscopic examination proved this growth to be nonmalignant.

October 11th, no recurrence; in good condition. Discharged.

Case 8.—Mr. Mstrs., fifty-four years of age. This last case that I desire to report is the one in which suspension was easily performed, but the growth could not be reached. Dr. Beck reported this case before as a case of adenocarcinoma situated on the left vocal cord, near the anterior commissure. Massive doses of X-ray treatment had been given, which seemed to cause it to disappear, as no sign except a roughness of the cord could be seen six months after the discontinuance of the X-ray.

He returned one year later, and what seemed to be granulation was removed at site of old growth. This was curetted away and the base touched with silver nitrate and patient placed under observation. Examination about four weeks later showed a growth on the laryngeal surface of the epiglottis. He was again suspended and an attempt was made to remove a portion of this growth, but owing to the pressure of the spatula against the under surface of the epiglottis, this was absolutely impossible. This was again attempted, but unsuccessfully, as the spatula prevented the under surface of the larynx from being brought into view.

Under local anesthesia an exploratory incision was made over the larynx. Beneath the cricothyroid membrane a neo-

plasm was observed which had grown outward through the larynx, but which seemed to be encapsulated. Knowing the nature of the original neoplasm, we decided that nothing short of a laryngectomy would suffice. Consequently, three days later, under local anesthesia, a laryngectomy was performed, and patient made an uneventful recovery, and thus far there is no recurrence, four months since operation.

LIII.

THE DIAGNOSIS OF CEREBELLAR DISEASE—REPORT OF TWO CASES.*

By Edward J. Bernstein, M. D.,

Detroit.

The diagnosis of cerebellar disease, more especially of cerebellar abscess, is of vital interest to otologists whose sphere of activity lies in such close proximity, as the etiology bears so close a relationship to ear suppurations.

The subject is not readily comprehended and is still a matter of much conjecture, but there is much opportunity for putting into practical use what information can be gained by study. Much of the difficulty in the past in considering this abstruse matter has, it seems to me, been cleared up by a very simple key which in nowise alters the data as given by the Vienna school. This key is from the pen of Dr. Isaac Jones of Philadelphia. Alfred Braun, in a recent article, spoke of some eighty-six cases which have been reported since 1897. I am certain, as I look over the histories of some of my mastoid cases, I have in the past seen at least five or six cerebellar abscesses which were unrecognized on account of the lack of the knowledge which we now possess.

Cerebellar abscess is almost invariably due to ear suppurations. It is not always single, but may be multiple, and complicated with subdural or temporosphenoidal abscess. It may come with apparently no visible lesion in the middle ear—such cases have been seen and reported. It may be chronic or acute, encapsulated or free. One of the unfortunate conditions in connection with cerebellar abscess is that it often runs its course with practically no clinical symptoms, and death may occur before any symptom of intracranial involvement

*Read before the Detroit Oto-Laryngological Society, January 16, 1917.

can be detected. It is often obscured by other otitic or intracranial conditions. If encapsulated it may remain latent, quite unsuspected, for quite a long period; such a case is reported in Phillips' book.

An abscess in the antral or tympanic tegmen may lead to temporosphenoidal abscess. In the posterior group of mastoid cells or in the labyrinth there is a tendency to cerebellar abscess. The clinical course generally shows itself in three stages. In the initial stage, which more often follows a chronic than an acute abscess of the middle ear, the symptoms are not sufficiently severe to arouse suspicion. There may be some rise of temperature, headache, more or less severe, and vomiting. These are, however, of short duration, and seldom arouse suspicion of the seriousness of the condition. The disease runs a rapid course. One should be on guard for cessation of otorrhea, which often means the onset of intracranial complications.

There may be a latent stage, in which a very considerable brain or cerebellar abscess may be present, and may cause no definite symptoms, except probably a complaint of moderate headache and intracranial pressure, especially on increased mental effort. As the abscess progresses headaches become more or less severe and more or less localized, but their localization may bear no relation to the site of the abscess. Indeed, the symptoms may indicate trouble on the opposite side. Neither does palpation or percussion give any definite clue. In cerebellar abscess, in the early stage, frontal as well as occipital headaches occur. In my last case, to be related hereafter, the patient complained only of intense pain in the nape of the neck. Loss of appetite and loss of weight possibly, in the beginning, acceleration of the pulse rate, may be present, and slight rise in temperature marks its onset. Finally there come distinct symptoms referable to the brain, ushering in the manifest stage. Symptoms of septic absorption are now apparent. Greatly increased leucocytosis, increased headaches, general or local, and more or less expulsive vomiting point to the trouble. Optic papillitis may occur. Its absence does not influence diagnosis; indeed, it is more often absent than present. As intracranial pressure increases the temperature becomes subnormal and rarely rises, the pulse slows down

to fifty or sixty, there is impairment of mentality, various forms of aphasia supervene, later somnolence and apathy. alternating with excitement, follow.

In cerebellar abscess and new growths, patients who are able to walk show a characteristic gait (cerebellar ataxia). There are oculomotor paralysis, mydriasis, ptosis, facial palsy and abducens paralysis. Rigidity of the neck is one of the late symptoms of cerebellar abscess. If not relieved death ensues from increased pressure on the respiratory center. The respiration is slow, irregular, often of the Cheyne-Stokes variety, or the patient dies rapidly by sudden cessation of respiration, by rupture into a neighboring ventricle, or a meningeal involvement, with high temperature, rapid pulse, vomiting, convulsions and death.

Spontaneous recovery may occur by encapsulation of the abscess. Cerebellar abscess is oftentimes associated with sigmoid sinus thrombosis. The disease usually lasts from one to three or four months. In the latent stage, when the abscess involves motor centers in the cerebellum which are known to enervate definite movement, it had seemed possible that we might say, after full examination of the various signs, that the abscess or growth, as the case may be, occupies a certain definite portion of the cerebellum. A late analysis of some thirty-one cases of cerebellar tumor and abscess, by Dr. Ernst C. Gray of Boston, in the service of Dr. Cushing, shows that much which we had previously supposed would lead us to definite localization is not nearly so securely based, and without being able to exactly localize, all we can now tell is whether it lies anteriorly or posteriorly in the cerebellum, or probably whether left or right.

In considering localization of cerebellar growth or abscess we must recall the fact that the cerebellum records sensory impulses and sends out motor impulses, and the motor nuclei in the cerebellum are closely connected with the vestibular nuclei. Motor impulses reach the cerebral cortex from the cerebellum through the superior peduncle. Motor impulses from the arms, limbs, and other muscles reach the cerebellum through the inferior and middle peduncles. These motor impulses are met by sensory impulses from the muscles and joints, and by impulses from the vestibular apparatus, and are

here acted upon in such a way by the centripetal impulses as to make them effective in maintaining the equilibrium of the body. Any interference, either by abscess or by growths in these tracts, or in the nuclei or in these centers which have been found to enervate the given motions in the various joints, must necessarily disturb this equilibration. By dint of long continued research it has been ascertained that behind the internal auditory meatus, in the lobus biventer, there are distinct centers for the shoulder and wrist. Certain other centers for the motions of the shoulder have been found in the posterior inferior lobe. Certain other centers have been found for the motions of the trunk and hip muscles. It seems logical then that when a disturbance in the equilibrium of these joints occurs, not due to evident external causes, that we could say the disturbance lay centrally in the given centers thus ascertained.

Ordinarily a normal person with his eyes open, having pointed at a given object, can again touch the same object with his eyes closed. A patient with a disturbance in the cerebellum involving those centers enervating the joints thus used will not be able to do this with his eyes closed, and in attempting to point will deviate away from the object on the same side as that in which a cerebellar lesion exists. When a normal individual is rapidly turned in a smoothly turning chair ten times, and then suddenly stopped, he can no longer point true, and he imitates the condition of an individual with a cerebellar lesion. If a patient, on being turned, instead of deviating, points true, it indicates a cerebellar lesion.

Nystagmus is another one of the phenomena of cerebellar lesions. We must remember this fact, however, that nystagmus always means one of three conditions: either it is ocular, in which case it is always regular, rhythmic, and not influenced greatly by direction of gaze, and is usually due to a lesion in the eye capable of demonstration, except in such forms of nystagmus from congenital troubles which have been overcome, or in occupational disturbances such as miner's nystagmus. There is also a perfectly physiologic nystagmus in some individuals on directing the gaze to the extreme right or left. Nystagmus of cerebellar or labyrinthine origin differs from this in that it is of an entirely different character, being

composed of a quick (cerebellar) movement and a slow (vestibular) movement, so that in the presence of these latter phenomena, especially when it exists spontaneously, we must conclude that we are dealing either with a labyrinthine or cerebellar condition. This form of nystagmus can be evoked by rapidly turning the patient in a chair; by the caloric, galvanic or fistula tests, in which instance it has distinct characteristics both for the normal and for the pathologic conditions.

The difficulty of remembering these various reactions as given out by Bárány has deterred many from studying these phenomena. It seems to me that the key given by Dr. Jones, of which I spoke, while not altering the basic principles of Bárány and the Vienna school, do make it easier to comprehend them and to put it into practice. In brief it is as follows: A normal person when turned in a chair to the right will develop this nystagmic movement of the eye. Instead of considering it in terms of a quick and slow component, it is best to note the slow movement, which is a vestibular one and always in the direction in which a normal patient is turned. Also this same normal individual will now deviate in pointing to the same side to which he is turned. Applying cold water (temperature of 60° F.) to the normal ear will cause the eye to deviate to that same side, and the patient will again deviate in pointing away to that same side. In other words, turning a normal person to the right, a slow movement of the eye to the right is observed and a pointing deviation to the right. A cold caloric to the right ear will cause a slow deviation of the eye to the right and a pointing deviation to the right. Any changes in these phenomena indicate a lesion either in the labyrinth or the cerebellum or one of its tracts.

Labyrinthine nystagmus of diffuse labyrinthitis cannot be distinguished from cerebellar nystagmus in the first examination. Subsequent examination will show that the labyrinthine nystagmus tends to disappear by compensation. On the other hand, if it is due to cerebellar lesion it remains constant or becomes worse. When in such a case we can show that the labyrinthine function is destroyed, when the eyes deviate, either spontaneously or under stimulus, away from such an ear, it is obvious that the trouble is retrolabyrinthine—i. e.,

cerebellar. In a patient with nystagmus the direction of which changes suddenly, one may look for cerebellar involvement.

Hypermetria, unmeasured or immoderate movement, may occur spontaneously, but more likely in commanded movements done quickly.

Another symptom which may be present is cerebellar asynergy—inability to make the trunk follow foot movements, resulting in arrested progression. With arms folded the patient cannot rise from bed while lying on the back.

Adiadokokinesis is a loss of ability to rapidly execute successive movements. Muscular force is intact, but combined successive pronation and supination is more slowly executed than in the normal.

Tremor. On pointing to an object, orientation is correct, but movement is not uniform; there are oscillations in various directions.

Disturbances in writing. The patient being requested to make a dot on paper with a pencil, either goes through the paper, breaks the point, stops before reaching the paper, or makes a line instead of a dot. In attempting to make the round letters, like C and O, he gives them polygonal shape instead.

Disturbances of speech. These may be scanning, jerky, a little explosive, sometimes draggy, similar to disseminate sclerosis.

Atony or hypotony may be unilateral or bilateral. When the former, it is upon the same side as the lesion. This symptom is brought out by having the patient flex the forearm forcibly, the examiner opposing it by traction. When suddenly let go, in normal persons a pronounced flexion occurs, followed by violent extension.

Pointing reaction. We have come to a definite conclusion that all pointing reactions are primarily cerebral and not cerebellar, as hitherto stated.

Dr. Jones rightly maintains some inconsistency of findings, even in the same case, marks the vital characteristics of our subject. We are dealing with advancing processes, not fixed morbid lesions.

In reference to the apparent overthrow of our accumulated evidence regarding cerebellar localization, in a personal letter

Dr. Jones has this to say: "The main value of the ear tests seems to me to be, first of all, the rounding out in diagnosis of ear conditions, and then the definite value in finding out the cause of vertigo in any given case. They usually clear up well under these tests, but from the standpoint of the neurologist and the surgeon, in locating intracranial lesions to be sure there is a great deal that is encouraging from the development of ear tests. As for cerebellar localization, as a rule the cases (autopsies and operations) have shown rather accurate results of ear tests—not only whether the cerebellum is involved or not, but also which hemisphere, whether posterior or anterior, is involved. They have been particularly helpful in determining whether the lesion is operable or not."

Case 1.—On June 28th, this past year, I was asked by Dr. V. of Kalamazoo, to see a young man of twenty-nine years, who had been suffering for many years with running ears on both sides. The right ear discharged almost continuously, and the left more or less constantly. For the past year he had considerable pain in the mastoid region of the right ear. A few weeks before I was called he saw a specialist, who correctly insisted upon a mastoid operation, but this was refused, and he consulted his family doctor, who removed a polyp from the external auditory canal. The specialist who saw him told me that the man was suffering great pain and could hardly maintain his equilibrium and was very dizzy, and he made the tentative diagnosis of labyrinthine involvement, which was doubtless correct as far as it went. At any rate, when I saw him he was suffering excruciating pain in the nape of the neck and nausea, with a pulse rate of sixty and temperature of 99.2°. There was no tenderness over the mastoid, but a foul bloody purulent discharge from the right ear. It was impossible to get him to raise the head on account of the nausea and dizziness. Hearing in the ear was gone.

I was unable to make the proper tests for differentiation of labyrinthine and cerebellar abscess, but the clinical signs were so unmistakably of brain abscess and case so urgent, that he consented to immediate operation and was taken to the hospital and operated on at 9 p. m. A radical was done, and not a single mastoid cell was found in the ivory hard bone till we reached the antrum, when a large cholesteatomatous

and fungoid mass was removed; the tegmen antrum was carious, and further chiseling opened a large subdural abscess. I felt then that there was most likely a cerebellar or cerebral abscess, but hoped that this would drain enough. At any rate, I dared not do more, as his condition was rather critical, although I was not more than forty-five minutes doing the operation, despite the ivory bone. The patient was dressed and returned to bed, the family being informed that though I had found pus in the mastoid and some in the cranium, there was great likelihood of more being found deeper, and that another operation might be called for in a few days.

The patient passed a comfortable night, the first in weeks. His temperature next morning was 98.2°, and pulse eighty. He continued comfortable all that day till about 9 p. m., when he again complained of the pain in the nape of the neck, and his pulse rate was again sixty. I tried some of the more readily applied tests for cerebellar trouble, and felt sure we were dealing with a cerebellar abscess and so informed his physician, who opposed further operative procedures. During the following day the symptoms of cerebellar abscess were more pronounced, and, in spite of my best endeavor, I could not make the family doctor see otherwise but that the man was better. It was only after I threatened to withdraw from the case and explain my position to the family that I obtained the tentative promise to let me operate next day, if he thought the man was not better. It was a fatal mistake to even concede that much, as subsequent events proved. I tried to get consent to operate next morning, but was again blocked and promised a trial at noon, the doctor still insisting that the patient was better, but at noon I found him almost in extremis, under which circumstances the attending physician finally consented to operation. The patient died on the table while I was about to open the original wound. He died of respiratory failure—typical of untreated cerebellar abscess. Fortunately, I obtained a postmortem examination, and it showed general leptomeningitis and a large abscess in the anterior portion of the lobus biventer of the right side. There was also a small abscess under the anterior side of the left side. There had been no optic papillitis on either side.

Case 2.—On August 16th I was asked to see Wm. M., aged

twenty-four years, on account of loss of sight. He had absolutely no light perception in either eye, with very marked choked discs on both sides. The nerve was about three diopters high on left side, and about two on the right, where there was beginning optic atrophy. He had a slight facial paresis on the right side, exophthalmos on each side, no sign of enlarged thyroid, but he had a very high pulse rate which was easily increased by slight effort. He had a fine vibratory tremor on extending the hands, as in Graves' disease. There was a slight Romberg but no Graefe symptom. As he had no light perception, an Argyl-Robertson was out of the question. He had marked rotary nystagmus (spontaneous) on direct gaze, which was increased when he looked to the left, and not markedly increased when he looked to the right. He also had a slight vertical nystagmus when he looked up, but not on downward direction of the eyes. His trouble began two years before, with spells of falling backward. These have continued with more or less persistency ever since.

Spontaneous pointing tests, from the shoulder, wrist and elbow always deviated to the side of the arm tested—that is, to the right when the right arm was tested, and to the left when the left arm was tested. Heart was normal in size, but as well as I could make out there was a peculiar reduplication of the first sound.

Turning him to the right in the chair produced nystagmus to the left (Bárány nomenclature), but as I think we now will call it deviation to the right, and during this he pointed correctly.

Turning to the left produced deviation to the left and pointing to the left. There was presumably no labyrinthine trouble present. My diagnosis was a probable cerebellar growth. When observed again, about a week later, he had no rotary nystagmus, but a slight horizontal spontaneous nystagmus to the right was seen when he looked straight ahead; on looking to the right, slight increase of right nystagmus. On looking to the left he had a marked increase of the nystagmus to the left.

Pointing test. On turning him to the right he deviated to the right; on turning to the left he pointed true. Spontaneous pointing, shoulder test down, was true on the left side but

deviated to the right in upward movement of the left arm. On the right side spontaneous shoulder reaction from below up, deviated to the right; from above it deviated to left. Cold caloric to the right ear gave a horizontal deviation, slow vestibular movement, to the right; cold caloric left ear gave deviation to the left. Hot caloric in left ear accentuated the deviation to the left; on the right side it was negative. Pupils of both eyes were uniformly dilated to five millimeters and did not react to convergence—and of course not to light, as he had no light perception. The nerve was markedly choked in the right eye, with very tortuous veins, and arteries hardly perceptible. Hypometria right normal; only fairly executed left; no cerebellar asynergia; slight adiodokokinesis on the left side; tremor bilateral; no disturbance of speech apparent; some hypotony. In extending the arms out straight, he holds the left one lower than the right.

It was thought from this symptom complex that we had to deal with a cerebellar new growth—syphilis being excluded by a negative Wasserman. It was thought that we would find a growth somewhere in the region of the cerebellopontine angle, but most probably in both sides of the lobus biventer, according to the comparison of these findings and Bárány's results. The work of Gray supports the more conservative opinion of Dr. Biefeld, who simply stated that it is somewhere in the cerebellum. This is still a great help in case of operative procedure.

Owing to the fact that there was now very little hope of restoring his sight, and the very great probability that the patient might die from the anesthetic alone, in view of his heart condition, I could only state the chances and my willingness to undertake the operation, provided the family were willing to stake all or lose all, and they wisely decided not to take the chance.

SOCIETY PROCEDINGS.

NEW YORK ACADEMY OF MEDICINE, SECTION ON OTOLOGY,

Meeting of April 13, 1917.

Exploratory Tympanotomy for Relief of Deafness.—Presentation of Two Operated Cases.

Dr. Harold Hays said that, like many others, he has been studying the question of adhesive processes in the middle ear, and whether we would be able to get at these adhesive processes by operative procedure. We meet with a number of cases with fairly wide open eustachian tubes and retracted drums, cases in which we can do practically nothing so far as hearing is concerned. Many of these cases occur in young persons between twenty and thirty years of age. In about thirty per cent of these cases we have prolonged bone conduction, indicating some interference with the transmission of sound waves. This is probably due to adhesions between the ossicles or between the drum and the internal wall of the middle ear. Dr. Hays said, further, that having had this in mind for some time, he was finally able to secure some fresh autopsy material, with which one is naturally able to do work that is impossible with the ordinary cadaveric material, owing to the shrinkage and destruction of tissues. With this material he had been able to devise a practical operative procedure which is simple, yet apparently effective.

The patients presented (two) were operated upon only a week ago, and it was not yet possible to state whether or not the hearing would be permanently improved, though there was strong hope that it would be. Neither one had had any reaction whatever—no fever, nausea, nor vomiting—within the first few days. On the fifth day, however, the young man had become nauseated, but that cleared up under calomel. Both patients' wounds healed by primary union, and there was

nothing to be feared from an active labyrinthitis or secondary infection, though both still have some slight discharge.

Of course, it was impossible to make any hearing tests at the present time, but neither of the patients could hear a watch or the whispered voice before operation, and both claim that they can now hear much better with the operated ear than they could before.

Dr. Hays said that he offered this procedure merely to show that it is practicable from an operative point of view, and that he hoped to employ it in a great many more cases. It was desirable that the test for hearing should be made by someone else before the operation, who would repeat it some time after the ear becomes dry, and note the result. If the procedure accomplishes what is hoped, the hearing will be improved in an appreciable degree.

Someone had asked how it was expected to prevent the formation of other adhesions. To that one might reply as the abdominal surgeon does. He does not claim that other adhesions will not form, but he endeavors to prevent them from interfering with function. Everyone has seen cases where the middle ear has numerous adhesions and yet the hearing is good.

DISCUSSION.

Dr. Seymour Oppenheimer said he hoped that the work which Dr. Hays had been doing would not prove to be love's labor lost; but the same work had been attempted by himself according to a different technic, and it had been tried by others, dating back long before his time or Dr. Hays' time. All are familiar with the very delicate instruments which were designed and used by Buck, Roosa, and others for the severing of intratympanic adhesions; yet these have long since been forgotten and fallen into disuse. One point Dr. Hays has lost sight of, and in all probability all other workers as well, is that the ossicular chain is not necessarily the only portion of the auditory apparatus that is concerned in the question of hearing, and it is not alone adhesions that form about this portion of the ossicular chain, but adhesive fibrous tissue forming over the promontory and about the oval window, binding down the stapes, which interferes with the sound wave

and is the most responsible for deafness. The question of whether or not an individual has a drum does not always influence the hearing. Patients are often seen with almost no drum remaining as the result of a suppurative process, yet with almost normal hearing.

Some fifteen years ago Dr. Bates, an ophthalmologist of this city, advocated cutting away the adhesions around the oval and round windows on the promontory. After his preliminary operation he found that the hearing of the patients was very decidedly improved; but he was compelled subsequently to reoperate repeatedly in order to maintain the hearing. These operations were done under local anesthesia. In one instance he operated no less than seventy-odd times, and each time that he cut away the fibrous connective tissue there was a definite improvement in the hearing, which, however, always reformed and the hearing receded to where it had been before.

Stimulated by Dr. Bates' suggestion in this line of work, Dr. Oppenheimer took up the proposition, some twelve years ago, and attempted, after having performed the Stacke operation, to cut a trephine opening in the promontory, for which purpose he devised some very delicate instruments, and then attempted to transplant over the opening which he had made something which would act and allow the transmission of the sound wave as the drum membrane would, employing cargile membrane, then areas of epidermis, the vitellum of the egg, etc. He succeeded with the epidermal graft in a number of instances, and while in each of these cases there was a very definite improvement of the hearing for the briefest time, yet it was not maintained.

While Dr. Hays' work is very admirable, it was to be feared that his final results would be disappointing.

Dr. Hugh Blackwell said that while he hesitated to speak in a derogatory manner of work that was still in its incipiency, anyone who attempts this work should bear in mind the ever present danger that in these cases the patient may develop a mastoiditis. Of course, both these patients have now what is practically an acute inflammation of the middle ear. A number of years ago Dr. Heath treated the drum with cantharides and produced a very severe reaction. In one instance the pa-

tient developed an otitis media purulenta acuta and had a series of complications. Dr. Blackwell said he had also heard of another case which ran through numerous complications and developed an acute otitis, and finally died of miliary abscess.

DR. HASKIN said that Dr. Hays was to be congratulated upon attempting to do almost impossible things, but that it was nothing new to break up adhesions. Work of this kind was described in Politzer's old book. It is simply a question of getting at the adhesions, wherever they may be. As he understood, Dr. Hays goes behind and separates the membranous canal from the bony, thus reaching the middle ear. As Dr. Oppenheimer had said, one must feel some pessimism as to the final results. Most otologists have tried procedures of this kind, and all have failed. Dr. Yankauer had experimented, making incisions in the drum membrane, and had failed. Dr. Haskin said that he himself had tried it in a series of cases, and had failed. It has been impossible for him to keep these adhesions from reforming. He hoped that Dr. Hays would succeed, but feared he would not. Dr. Sexton had tried to do the same thing, and for a time there was great enthusiasm all over the country about his work, but finally he had to disappear on accountof damage suits resulting from the effects produced. Apparently, the hearing is improved for a while, and then it grows worse.

DR. HAYS (closing the discussion) said he thought everyone present would appreciate the fact that he was not claiming to be attempting to do anything new so far as the middle ear is concerned; he was merely trying to find a proper approach to the middle ear, so as to get a certain exactness which cannot be attained by the ordinary method. All must admit that work in the middle ear through the canal is a very inaccurate procedure; moreover, the attempt to work in the middle ear through any such opening as given by the Stacke operation is unsatisfactory also. By this new operation one gets a very fair view of the middle ear. The illustrations shown were made by an artist who had never before seen the middle ear.

He had thoroughly reviewed the literature on the subject, including Politzer, etc., and had noted, moreover, what Politzer states, that if an opening is made in the ear drum, as long as it remains open, the hearing will be better. But we have

never been able to keep a perforation of that kind open permanently. Again, Politzer, like others, tried to relieve adhesions, and cut the muscle leading to the malleus, and the stapedius muscle, etc., but not with any particular exactitude. Dr. Hays said that so far he has only adapted eye instruments for this work.

As for the work done by Dr. Bates and others, Dr. Hays said he believes that if one attempts to remove any definite adhesions around the oval window he would fail—one does it in a way that he is bound to have adhesions; but there are any number of these cases where the adhesions in the round and oval window can be modified. The procedure was presented merely as an operation which might prove successful in a number of cases.

Replying to Dr. Blackwell's remarks, Dr. Hays said that any patient upon whom this operation is performed should have so little hearing that he would be willing to take any chance for improvement; patients like those presented, who cannot hear at all, and cannot work because of deafness, will be willing to take great chances. The fear of a possible labyrinthitis in these cases had worried him a good deal for a few days. Another point which had been brought up was the question of the Heath treatment for dry relaxed ear drums, which was a very different thing from adhesions in the middle ear. Dr. Hays said he had written a paper on this subject some time ago. Dr. Hays said he had never had any trouble in that operation. He had not had very many cases; but in the few cases where he had gotten results, they had been moderately good, and had been attended with no danger whatever.

A Case of Mastoiditis in a Diabetic. Extradural Abscess, Perisinus Abscess. Recovery.

Dr. Otto Glogau: Dr. R. H. Urquhardt (*Medical News*, March 21, 1896), in discussing his two cases of mastoiditis in diabetic people, said: "That there does seem a special tendency to inflammatory changes in the mastoid region in the dyscrasia under discussion, there is unmistakable evidence, but as to the existing relationships we are as much in the dark as we are ignorant of the true nature of the diabetic diathesis."

J. E. Sheppard (*Medical News*, May 2, 1896) does not believe diabetes to be an etiologic factor in mastoiditis.

A. H. Buck (Transact. Am. Otol. Soc., 1895, quotes the entire literature on the subject then existing, and is very much in favor of an early operation. The prognosis of mastoid operation on the diabetic is a good one in his opinion.

J. D. Richards (*Archives of Otology*, 1907) establishes even a pathognomonic symptomatology for diabetic mastoiditis. The slow march of the mastoid symptoms and the absence of marked inflammatory phenomena (until late) argues, according to him, not so much a virulence of infection in certain cases with extensive destruction, as a low vitality of the tissue. The postoperative condition of the wound also points to this. A successful issue depends largely upon the rapidity of operation and the short duration of the anesthesia. The bone should be removed well beyond the apparent limit of involvement and a very thorough operation done, as the tissues are suffering from a dyscrasia and are more extensively involved than is indicated to the eye. Diabetes seems to be accompanied by vascular changes. In diabetic sinus thrombosis the vessels should be opened but the clot not disturbed, except removing the main portion of the thrombus.

The literature on the subject became quite large of late. The question as to the etiologic importance of diabetes has not yet been settled. We know, however, on the other hand, that in many cases with normal metabolism, glycosuria was found after mastoid operation.

The writer operated four cases of mastoiditis in diabetic persons, including the one represented tonight. He comes to the following conclusions: Diabetes as such is no etiologic factor for mastoid involvement. The exciting cause is always a predecessing cold or other infection. In an ear thus weakened, diabetic mastoiditis develops. It is similar to the luetic changes within the ear and nasopharynx, which, according to Gerber and Gradenigo, also occur almost exclusively in previously affected organs. The pathologic process is very destructive and involves with predilection the sinus. The symptoms do not differ from other middle ear and mastoid suppurations. The operation should be performed very early. The narcosis should be short and consist of chloroform. The oper-

ative procedure should be as quick as possible. The diseased tissue should be removed further into the healthy portion than apparently necessary. The wound should not be closed. The percentage of sugar is of no importance as far as the prognosis is concerned, which in most instances, when the operation is performed early, rapidly and thoroughly, is a good one.

Following is the history of the case presented:

Mrs. C. R., fifty-four years old, took sick on April 7, 1917. She felt a slight pain in her left ear. A few days previously she had taken cold. Upon application of hot water bags the drum opened by itself. She was treated for an entire month by a doctor. Her condition grew worse. She developed severe pains over the mastoid and could not sleep any more.

June 3, 1916, I was called in consultation by Dr. Maguire, whom the family had asked to see the case. The patient was in a very much weakened general condition. There was a large swelling behind the right ear, showing redness and fluctuation. The entire mastoid region was extremely painful. The drum could not be inspected, as the canal wall was sagging to such an extent as to fill out the lumen entirely. There was slight discharge from the canal. The patient was suffering from diabetes for several months, and the sugar amounted to six per cent of late. Immediate operation was advised. The patient was removed to the Philanthropine Hospital. After the usual semilunar incision pus was seen in large quantity, and a fistulous opening was detected in the cortex. The mastoid process, including the tip, proved to be totally destroyed and replaced by necrotic granulations and pus. The necrotic process had reached the dura and formed an extradural abscess, which was opened and the dura exposed about one and one-half centimeters. There was an exposure of the sinus three-fourths of an inch in length, the destructive process having destroyed the bony wall of the sinus to this extent. The sinus wall seemed discolored, but not thickened. Under usual precautions the sinus was incised and a small thrombus was washed out with the current of blood. The bony tissue was removed away into the healthy portions. The wound was left open and drained. The narcosis, chloroform, lasted twenty minutes. The healing process was rather sluggish. The

granulations were stimulated by scarlet red applications and dietetic measures. The external wound closed six weeks after the operation. The patient has now about two per cent of sugar.

Perisinus Abscess With Apparently Normal Sinus, Followed by Extensive Thrombosis With Multiple Metastatic Abscess. Removal of Clot From Sinus and Bulbus. Jugulectomy. Recovery.*

By Otto Glogau, M. D.

DISCUSSION.

Dr. Alfred Braun was inclined to question one statement made by Dr. Glogau—i. e., that in diabetic cases the operation should be as thorough as possible. The diabetic is a bad operative risk at best, and in the cases which he himself had operated on, the more thorough the operation had been the worse the result. The only cases which had recovered were those where as little as possible was done.

Dr. Seymour Oppenheimer said that he had performed a number of operations on individuals with some glycosuria, but all the successful cases were operated upon under local anesthesia. Two cases that were operated upon under general anesthesia succumbed, though he did not know whether that was an important point or not. The general surgeon operates on many such patients who do not succumb. The question is not so much in regard to glycosuria as of the presence of diacetic acid or an acetonuria. Diabetics, of course, have very low reparative powers, and the destruction of tissue is very rapid. In one instance a distinct crepitus was felt on palpating the mastoid. Later it was found that by the pressure the cortex had been fractured.

The preoperative preparation of these patients is most important. Unless the case is showing some very violent symptoms, it is better to delay the operation for a number of days until the patient's condition has been improved by dieting. The administration of atropin will reduce the sugar very materially. The postoperative care of these cases is also very important—not so much the restriction of the diet, for that

*See page 788.

follows naturally after operation, but the administration of alkalies, both by mouth and per rectum, is of great value.

Dr. Oppenheimer said he agreed that the operation should be performed as rapidly as possible, and the operative work limited simply to the performance of proper drainage.

In the case of sinus thrombosis he had the privilege of seeing the patient in consultation with Dr. Glogau. She had evidently had an aseptic lower end of the thrombus, or the blood culture would have been positive. The question had arisen as to the advisability of primary jugular ligation. Dr. Oppenheimer said he objected to the primary ligation, as he does not consider it advisable before exposing the sinus. Then one can be guided by the condition as to whether or not jugular ligation should be performed. While it is true that probably ninety per cent of patients with a thrombus of the sigmoid, with a positive blood culture, do not require jugular ligation, yet some ten per cent at least can be handled without such a procedure, and he doubts the wisdom of beginning with a primary ligation. One thing that was very characteristic in this case was the absolute euphoria which this patient had; that is very characteristic of sinus thrombosis.

As to the question of the advisability of the surgical technic which Dr. Glogau employed: it is very doubtful whether the Gruenert operation is ever necessary. It may be necessary in this operation, by reason of certain anatomic conformities, to remove the condyloid process, but it is a question if the same result cannot be accomplished without resorting to that extremely difficult procedure. Having the torcular end of the sinus above compressed, and having the portion of the vein above the clavicle ligated, if it is not possible to establish free bleeding from the bulbar end of the sinus, one might content himself with introducing a drain into the bulbar end of the sinus and utilizing the upper end of the vein in the neck as it emerges from beneath the mastoid, as a drainage tube. He questions how much systemic absorption arises from the small collection of thrombus which is left in the bulbar end of the sinus, for such absorption can only be through the inferior petrosal sinus, which is of very small caliber. This thrombus disintegrates and is in the nature of a local abscess which drains into the neck wound. He believes this procedure sim-

pler and just as efficacious as the difficult surgical proposition which Dr. Glogau employed.

Dr. Haskin said that he had had some experience in operating for mastoid conditions in diabetic patients, and has no hesitation in doing so. Dr. Oppenheimer had spoken of the importance of the postoperative care and alkalin treatment of these cases, but personally he had not found this necessary. In three of these cases he has given morphin and atropin before operating, and all recovered, apparently without any disturbance whatever; nor did any of the patients receive alkalin postoperative treatment, or any attention to the diet other than restriction.

He agreed with Dr. Oppenheimer in regard to the Gruenert operation, which is a beast of an operation. Anyone who will study dissected bones, as had been done at the last meeting of the section, will realize that in a majority of cases one can trace the lateral sinus and the sigmoid sinus through the mastoid and reach the bulb, for the external wall of the bulb lies directly in front of you, as it rises at the final turn of the sigmoid. In many instances it will extend under the middle ear, and you can get in by following the wall deep into the canal. You do not have to go through the deep soft tissues at all to get to the jugular bulb itself; the drainage from below, as described by Dr. Oppenheimer, is ample, and instead of using a drainage tube, chromicized catgut can be employed, as it is flexible and will be easier inserted into the vein.

Erysipelas as a Complication of Mastoid Operation.*

By Harold Hays, M. D.,

New York.

DISCUSSION.

Dr. Dwyer said he had not much to add, excepting to emphasize some of the points brought out by Dr. Hays. As far as the organisms are concerned, in all the cases that developed at the Manhattan Eye, Ear and Throat Hospital, the streptococcus hemolyticus had been found. They had never had erysipelas with mastoiditis that had any other organism.

As to the spread of the disease in front of the ear, that is probably because the lymphatics spread forward.

In making a differential diagnosis between sinus thrombosis, meningitis, and erysipelas, it is generally found that with erysipelas there is a low pulse, whereas in meningitis there is a high pulse—say a case with a temperature of 105°—within twenty-four hours after operation, and nothing else, but running a pulse of one hundred and twenty to one hundred and thirty. In such a case he had made a diagnosis of fulminating otitic meningitis rather than erysipelas, and the patient died later of meningitis. Dr. Dwyer said he had never seen a pulse in erysipelas go above one hundred. That is one good distinguishing point.

Regarding blood cultures, in uncomplicated erysipelas, the blood culture is negative. If the erysipelas lasts long enough, you can get a positive culture. In one case that he had seen, the patient had been sick for three or four weeks—the erysipelas would extend down to the feet and then clear up, and then break out again—and in this case a positive culture was obtained, and later death ensued. The longer the erysipelas lasts the worse it is, unless something like the leucocytic extract can be used.

Clinically, there are two distinct types of erysipelas. One occurring in strong adults, the sthenic type, where the temperature rises and continues high, like pneumonia; it continues for five to nine days, with a temperature of 105° to 108°, and then falls by slow crisis. The other type occurs in the asthenic individual, and it occurs and recurs in the same area from time to time, with a typical septic temperature of 100.5°—high up in the evening—totally different from the type that approaches pneumonia.

The blood count is useless, for it will not differentiate meningitis, pneumonia, or sinus thrombosis.

With regard to the extract, Dr. Dwyer said the main point is to give it often enough and to follow up the case. Local applications have no effect whatever, excepting on the mind of the patient. The great point is whether to isolate these cases or not. He has attended hundreds of these cases with other doctors, all over the city, and was also on a very active service with Dr. McKernon at the Manhattan, and never yet had he

had personally a case of erysipelas. His plan would be to use personal precautions with the nurses in the wards, for it is possible that the infection might be carried on the hands of the nurses.

He has never seen any infection excepting with the streptococcus hemolyticus, and the erysipelas streptococcus belongs to that group. If the patient is left in the wards, and the same nurse observes sterile precautions and washes her hands, the disease will not spread. It has been known to follow certain men year after year; it follows their services, whereas in other services it never enters. The subject was a very timely one, for very little is known about it—the cases are shifted to the city hospitals and then lost sight of by the operator in attendance.

DR. HAYS asked if Dr. Dwyer thought the infection came from the mastoid wound.

DR. DWYER replied that in his opinion the infection in the mastoid is the infection in the erysipelas; the infection gets into the cellular tissue. Personally, he accounts for the length of time that elapses before the erysipelas develops by remembering that we have three clinically objective forms of erysipelas—cutaneous, cellulocutaneous, and cellulitis. The cellulitis, or deep form, may go on for some days before the condition comes to the surface. The cellulitis form does not usually go on to pus formation, and hence he believes it very poor surgery to make multiple incisions in these cases. An interesting point in regard to leucocyte extract is its use in infants. He had been told by leading pediatricians that the death rate in infants under one year is fully one hundred per cent. In his series, reported some years ago, the mortality was only thirty-three and one-third per cent.

DR. DANZIGER asked if Dr. Hays had found that erysipelas is more virulent at certain times of the year. He himself has seen more erysipelas cases in the spring and early summer than at other times. Is that a coincidence?

Speaking of the therapeutic value of the blood of patients recovered from erysipelas, it would be interesting to know how soon he uses the blood, for we know that one attack of erysipelas does not make the patient immune. We know that he can have another attack, as in diphtheria.

Dr. Danziger also asked if Dr. Hays had seen the symptom described by Ruttin, "nystagmus toward the affected side," which, other symptoms being missing, make him suspect erysipelas. He himself has seen the early involvement of a lymphatic gland in the region of the submaxillary gland. Concerning the question whether the infection comes directly from the mastoid infection or is extraneous, it would seem that we have to differentiate as to the time when the infection occurs. If it occurs early in the infection, probably Dr. Dwyer is right; but cases have been seen where the wound had practically healed, and erysipelas suddenly developed.

Dr. Friesner, referring to the matter of pulse rate, said that while it is true that with erysipelas there is not usually a particularly rapid pulse, yet in Dr. Glogau's sinus case the pulse rate averaged ninety up to the time of operation. He himself has seen a number of cases of sinus thrombosis with a comparatively slow pulse—whether or not that meant increased intracranial pressure, due to venous stasis, he did not know; but too much stress should not be placed upon that point as a means of differential diagnosis. It is not at all infrequent for an erysipelatous patch to appear on the side opposite to the operated ear. It would seem that if the erysipelas were due to infection from the hair, it would always occur on the same side. Whether it be due to the organism in the mastoid wound or to an extraneous organism brought to the unhealed wound, is beside the question. It would seem that the cut or the granulated surface was the place of entry of the infection, the transmission being through the lymph channels. It has been often shown that hair may be dropped into culture medium and yet the medium remain sterile.

Dr. Blackwell said that practically all the cases of erysipelas occurring at the New York Eye and Ear Infirmary are transferred to Bellevue and treated there. He had formerly been house surgeon at Bellevue, and the number of remedies that had been tried there is legion; nearly all have their enthusiastic advocates. While he was on service there they clinically recognized two classes—of the head, and of the body. The large majority of the cases were confined to the head. If it stopped at that point, the patient recovered; but if it went below the collar line and below the chest line, it did not stop

until it extended all over the body, and the patient was very sick. Fifteen years ago it was a matter of common observation that a large number of the mastoid cases that came in had erysipelas, and a point that struck all the men that had to treat these cases was the fact of the very great pressure caused by the tight packing of gauze in the mastoid wounds. At Bellevue, where all kinds of infective conditions are handled, the men are not accustomed to packing the wounds so tightly, and many of them attributed the frequent occurrence of erysipelas with mastoid to this tight packing. At one time it was the custom of many surgeons to lean on the packing and make it as tight as possible, and at that time the number of erysipelatous mastoids was much greater than now. In his opinion, one cause of the lessened number of erysipelas cases is the improved technic and the tendency to pack the mastoids more lightly.

As for the treatment, the method which had given the best results had been the administration of whiskey and saline solutions—cold applications of saline solution makes the patient more comfortable, and the whiskey stimulates him.

Dr. Seymour Oppenheimer said that in noting erysipelas in connection with mastoid operations, he had been impressed by the association of suppurative conditions in the accessory nasal sinuses. A few years ago he had made that statement, and at that time he did not recall having seen a single case of erysipelas without some suppurative condition in the nose. He is not yet prepared to state what relationship may exist between the two, but there is food for thought in the suggestion. It is quite possible that there may be an abrasion on the lip or cheek which becomes infected, and this infection is subsequently carried through the lymph channels to the aural wound. One point which should be considered in this connection is the development of what looks like an erysipelatous process, and which is a dermatitis due to iodoform. Dr. Oppenheimer said he has seen two cases where the local cutaneous lesion resembled erysipelas, and there were systemic manifestations as well. Both patients started off with severe chills, sharp temperature rises, and evidences of a hemorrhagic nephritis. In the first case it never occurred to him that it was iodoform poisoning. The process gradually subsided;

whether it was modified by the treatment could not be stated positively. This particular individual, it was discovered, was extremely sensitive to almost every drug. A slight quantity of xeroform dusting powder, employed when the wound was almost healed, produced the above mentioned local and systemic symptoms for the second time.

It is very curious to note a drug can produce symptoms so analogous to a bacterial infection.

Dr. Oppenheimer said that he had had some experience with Hiss' leucocyte extract, and believed that it had some influence in reducing the temperature. Of local applications, alcohol was his preference, and he believed it to be of value in limiting the progression and severity of the local lesion. The ichthyol treatment of old is most disagreeable, and does not have much influence, and makes a very dirty mess. He had seen three cases develop erysipelas where the sigmoid sinus had been injured during the operation. No untoward symptoms, however, arose from this source. He also used defibrinated blood taken from another patient. Also the serum of the individual patient, but is not prepared as yet to state whether the influence of this line of treatment is of value.

Dr. Braun said that he had seen a very unusual onset in two cases. Ordinarily one expects to see the erysipelatous rash appear within twenty-four or forty-eight hours after the rise of temperature, but in one of these cases the temperature rose and remained high for five days, and in the other it was six days before the erysipelas appeared. In the latter case he had almost made up his mind to explore the sinus, when the rash appeared.

Dr. Haskin said that some years ago he had read a paper before the section on the Hiss extract, and expressed his belief in it. He is not, however, a believer in the extract prepared by Squibb. It is made from the serum of a horse. It is a clear solution, and has not the appearance of the Hiss extract; he has used it two or three times, and the results were not satisfactory. The Hiss leucocyte extract is prepared from the pleural cavity of rabbits, and gives good results. Hiss, in his monograph on the leucocyte extract, states very distinctly that unless the leucocyte bodies were themselves injected into the tissue he got no results. Making a clear extract of the

bodies of the leucocytes did not bring results; these were only obtained by injecting the triturated bodies of the leucocytes. Then you get apparently the building up of the leucocytes themselves, which gives increased resistance.

Dr. Haskin said he did not know whether or not the leucocytes are in the Squibb extract; it is a clear solution and does not resemble the extract prepared by Hiss. It seems a pity that they cannot follow the procedure which was followed by one of the greatest men we have ever had in this country or any other. Hiss had tried several animals, but could not get from the dog or other animals the results obtained from rabbits. It is greatly to be regretted that the Hiss extract seems to be a thing of the past. With the high cost of living, etc., the price of rabbits had gone up so that we cannot get the material. Dr. Haskin said he was glad to hear that Dr. Hays had obtained results from this extract. Perhaps he would himself try it again, but he certainly would not waste time with it in extreme cases.

Dr. Hays, closing the discussion, replying to Dr. Danziger, said that the greater prevalence of erysipelas during the spring and summer was probably due to the fact that it is then we have more mastoid cases. He had never observed the matter of nystagmus with this condition.

As regards the question of using the citrated blood, he regretted that Dr. Wright had not been able to be present, as he claimed to be getting some very good results. In most of the cases that occurred at Bellevue the patients had given positive Wassermann reactions, and it had not been possible to get much blood.

Dr. Blackwell had spoken of the tight packing of the ears in mastoid cases. Dr. Hays said that he himself never packs the mastoid, so that in none of these cases could the erysipelas be ascribed to that.

Dr. Oppenheimer had spoken of suppuration of the accessory sinuses. In the first case of erysipelas Dr. Hays had treated nine years ago, the patient had had a terrific sinus trouble after the erysipelas disappeared.

Dr. Hays said that he was surprised at Dr. Haskin's experience with the Squibb extract that had been shown tonight. Dr. Zinsser had advised him to go to Squibb for the extract,

and he had naturally inferred that it was a good preparation; his results had certainly been very gratifying. In the original work he had done at the laboratory some years ago he had used rabbits for this purpose.

In response to a query as to whether any of these cases had had atrophic rhinitis, Dr. Hays replied that some of them had complained of dryness of the nose and throat, but that had naturally been ascribed to the fever.

NEW YORK ACADEMY OF MEDICINE, SECTION ON OTOLOGY.

Meeting of May 11, 1917.

Plastic Operation for Restoration of the Auricle, Following Injury From an Explosion.

DR. HARMON SMITH: Patient, aged thirty-five years, married; no previous history bearing upon the present condition. On April 28, 1915, he, together with three other councilmen of South Bound Brook, were called upon to investigate a sewer tank in the Raritan river. While in the tank there was an explosion of sewer gas, the cause of which was unknown. Two of the party were instantly killed by the explosion, a third was permanently injured, and the fourth, the patient whom I present, lay between life and death in the Monmouth Memorial Hospital for a period of more than five weeks.

He first came under my observation in February, 1917, nearly two years after the accident. Examination revealed the destruction of the upper part of the helix of the right ear, a union of the lobe with the tip of the mastoid and neck behind and below the lobe in one large keloid mass. The entire ear was held back by adhesions to the side of the head, while in front of the ear and on the neck were extensive keloids. The left ear was not so extensively burned, although the perimeter of the helix was destroyed on its superior tip for a depth of a quarter-inch. The left upper eyelid was also involved, so that there is an eversion and foreshortening of the lid. Under ether anesthesia, in February last, I undertook to first make him a new lobe, by cutting out some of the scar tissue below the ear and underlapping it to form a new lobe. Secondly, I made a curvilinear incision one and one-quarter inches back of the ear, and elevated the tissues down to the periosteum, which permitted the ear to be advanced forward. Thirdly, I took a flap from the healthy tissue back in the scalp, posterior to the burned area behind the ear, and leaving the base fixed superiorly, carried it over to the destroyed helix and fastened it there with horse-hair sutures, having first prepared the area

for transplanting. This I left in place for six weeks before detaching from its base. All the operative procedures were successful and the patient made an uncomplicated recovery, except that during the time of healing there was a slight frost bite of a part of the transfixed tissue, which at one time threatened the favorable outcome of the operation.

I likewise removed a large keloid from the neck, about an inch long and one-quarter inch wide.

I present this case at the present moment to demonstrate in a measure, by showing the uncorrected side, the difficulties to be encountered when dealing with keloids and tissues which have had their vitality lessened by burns.

The patient also had his left hand severely burned, almost necessitating amputation, and at the time of operation I drew out what remained of the nails on his fingers. I attempted to skin graft the back of his hand, but the bleeding was so profuse that it was impossible to get a graft to take. I expect at the next operation to pursue about the same course, with regard to correcting the deformity of the left side.

DISCUSSION.

DR. PHILLIPS congratulated Dr. Smith on the remarkably satisfactory result achieved. In his own wide hospital experience he did not recall any case where more or less deformity had been so satisfactorily overcome. Dr. Smith had shown much mechanical ingenuity as well as skill in carrying out his ideas.

DR. QUINLAN said that he wished to second what Dr. Phillips had said. The result was certainly marvelous, and it was a pity that photographs had not been taken before and after the operation. The cosmetic effect was certainly most acceptable, and the profession, as well as the patient, was indebted to Dr. Smith for the time and skill in bringing about such a result. One seldom sees these external conditions corrected in such a satisfactory manner. Dr. Smith had more than once showed equally gratifying results by his ingenuity in paraffin injections.

DR. HASKIN said he had read that X-rays have been employed successfully on very extensive keloids, and asked if Dr. Smith had tried that treatment in this case.

DR. SMITH replied in the negative.

Chronic Otitis Media With Cholesteatoma—Unhealed Mastoid Wound—Cured by the Modified Radical Operation.

DR. JOSEPH H. O'CONNELL: The patient, twenty-five years of age, was admitted to the Post-Graduate Hospital on August 8, 1916. About a year previously a Schwartze operation had been performed. The posterior wound healed in due course of time, but the middle ear continued to discharge more or less freely. Later, the patient began to have pain, and the cicatrix broke down, leaving a sinus which existed when she presented herself for treatment. She complained of more or less pain and of having frequent attacks of vertigo. Examination showed that the lower portion of the brain was in a fairly normal condition. There was a small peripheral perforation in the posterior superior quadrant. When a bent probe was inserted into the sinus and down to the aditus, foul smelling cholesteatomatous matter could be easily forced through the opening in the sinus. The patient's hearing was very poor. Unfortunately, the record made of the hearing previous to operation was misplaced or lost.

On account of the good condition of the drum membrane, and feeling that the ossicles were not necrosed and that most of the trouble was in the antrum and aditus, it was decided to do a modified radical operation. The incision was made through the cicatrix, and the cartilaginous canal was separated from the bony wall. The antrum was enlarged, and the posterior bony wall was taken down. The field was enlarged at the expense of the pillars and the posterior bony wall lowered to the facial ridge. The external wall of the attic was carefully removed and all débris cleared out from the antrum and aditus. Care was taken not to disturb the ossicles and drum membrane. The operation was concluded in the ordinary way by suturing the posterior wound and firmly packing the antrum and aditus through the enlarged meatus. The patient recovered with a perfectly dry ear. She now feels well, has no more attacks of vertigo, and says that her hearing has been greatly benefited.

Dr. O'Connell said that he claimed nothing new in this case, but presented it simply hoping to stimulate otologists to further effort in this line. Dr. Hugh Blackwell, in reporting his results in a series of cases in which he had done the modified

radical operation, concludes that this operation has the advantage over the ordinary radical in that the hearing is more likely to be improved. This case seems to bear out his claim, and this would seem to be the operation par excellence in selected cases.

DISCUSSION.

DR. PHILLIPS said that all must admit that sporadic cases of this type get well with this method of operation, but this section in otology should be very cautous in giving approval as to what may be expected in results from the operation if universally employed. Dr. O'Connell had wisely qualified his commendation by emphasizing the value of the work in a selected case. The operation should only be performed on suitable cases, and they are few and far between.

DR. C. H. SMITH said he had seen this case in the Post-Graduate clinic, and it seemed like a case that one would select for the radical mastoid operation. The discharge was very offensive, and the patient complained of vertigo, and he personally had felt very pessimistic about Dr. O'Connell's operation, and had been very much surprised at the excellent result obtained.

DR. GUTTMAN asked what had been found at the operation. Did the doctor find in the antrum and attic cholesteatomatous masses, pus, bone affected? Were the ossicles normal, and why did he stop there and not enter the tympanic cavity?

DR. VOISLAWSKY asked just where was the perforation in the tympanum.

DR. HASKIN said that the Heath operation had been very carefully studied by such men as Mosher, who followed up a series of cases, and the ultimate result was not found to be favorable. Dr. Haskin said he was afraid that later Dr. O'Connell would find, as Dr. Phillips had suggested, that the cholesteatoma would recur. That had been his own experience in two or three cases. They healed very promptly, but a nucleus remained and there was a reformation of the cholesteatoma.

DR. FRIESNER said that the operation performed by Dr. O'Connell was not the Heath operation. Dr. O'Connell took out the attic wall and opened up practically all the spaces in

the mastoid and middle ear which are subject to the formation of cholesteatomatous masses—that is, practically all, for in one case recently operated upon he had seen cholesteatoma that was not in the antrum, aditus nor tympanum, but in the hypotympanum.

As he understood, Dr. O'Connell opens the antrum, works out the aditus, takes out the bridge, and removes the outer attic wall that corresponds with the roof of the bony external auditory canal, leaving the incus and the head of the malleus exposed. The operation was not at all the same as the Heath.

Dr. Phillips said that he could show a series of cases of chronic suppuration of the middle ear in which he operated, doing what he called the intratympanic operation, where he believed that the disease was largely located, or centered in the attic and the outer attic wall, with indication of disease of the ossicles, removing not only the drum membrane, but the outer attic wall. Most of these cases occurred in private patients who refused to have the radical mastoid performed, and the results obtained were perfect; but he had had other cases in which the results were not good.

Dr. O'Connell, replying to Dr. Voislawsky, said that the perforation was in the posterior superior quadrant—Shrapnell's membrane. The cholesteatoma seemed to be in the antrum and aditus, and the reason he did not touch the tympanum was that from its appearance he believed it to be in good shape. As in certain cases the desired result is obtained by the Schwartze operation, in others by the removal of tonsils and adenoids, and in still others by the Yankauer operation, so in this class of cases he feels that the modified radical is better than the Stacke operation.

Dr. O'Connell said he did not claim that it was the Heath operation. Dr. Blackwell has done similar operations, and on comparing the methods they were found to be practically the same. It is an operation that is suitable for those cases in which the tympanum is not involved and the ossicles are in good shape.

Replying to an inquiry from Dr. Phillips as to the hearing results, Dr. O'Connell said that unfortunately the record that had been made of the hearing was lost, and he had only the patient's word for the result; but she claims that her hearing

is better than before the operation. She now hears conversation at twelve to fifteen feet, and whisper at three feet. By leaving the drum membrane undisturbed, the result was probably better than if the eustachian tube had been curetted out. Where it is curetted out it is more likely to break down than if you leave a portion of the drum membrane.

DR. PHILLIPS said he was sure that the hearing would not have been just as good with the radical operation. He had one young patient who had suffered from otitis media suppurativa chronica nearly all her life. A radical mastoid was performed, and through some error the inner packing remained in the ear for nearly three months before it was removed; the ear was discharging all that time, yet the final result was perfect healing, and she could hear the acoumeter at twenty feet.

Acute Mastoiditis Followed by General Septicemia.

DR. WENDELL C. PHILLIPS: C. H., aged twenty-two years, single. About Christmas time patient began having severe pain in left ear. In two or three days the ear started to discharge profusely, but, despite the discharge, the pain gradually increased in severity. From the first he had fever and great tenderness to pressure over the mastoid area. His condition became constantly worse, and at the time of his admission to the hospital, January 17, 1917, he was in great pain and at times irrational.

January 17th, simple mastoid operation. There was a large perisinus abscess. Following operation the temperature rose to 106°. (See temperature chart.) Culture from mastoid, streptococcus hemolyticus.

Blood count, January 17th: Leucocytes, 31,200; polymorphonuclears, 81 per cent.

Blood culture, reported January 20th: Positive streptococcus hemolyticus. Spinal fluid, January 26th: White cells, 21 per cubic centimeter. Globulin negative. Culture negative. Wassermann negative.

On January 22nd, sinus and juguljar operation. No clot was found. Two days after the second operation small petechial spots over the chest, and large hemorrhagic blebs formed in the skin on the hands and feet. Culture from these

blebs showed staphylococcus. Blowing murmur at the base of heart. January 30th, death from sepsis.

Clinical diagnosis: Acute mastoiditis, followed by general septicemia.

AUTOPSY REPORT.

General Description.—The body is that of a fairly well developed, rather emaciated man. There is absence of body heat and rigor mortis throughout. The skin is yellowish to bluish white, with numerous small petechial hemorrhages distributed over it, especially numerous over the trunk. On the hands and feet, and occasionally elsewhere, are large blebs, some of which are hemorrhagic. The skin is loose over these areas, and upon removal small petechial spots similar to those described are present.

The head is swathed in bandages, with large pads over the right ear, and on removal the right side of the head is shaved, and there is a recent surgical incision in the mastoid region which is packed with iodoform gauze. There is also a second incision extending at right angles to this for a distance of three centimeters toward the occiput. Three centimeters below the first incision is a third one, extending for a distance of six centimeters along the anterior border of the sternocleidomastoid muscle. On removal of the dressings there is exposed a large cavity, which extends into the middle ear, and shows an entire removal of the mastoid cells with dissection into the lateral sinuses and downward, communicating with the external jugular. The dressings are blood stained, moist, and have no purulent exudate. The left ear has a sanguinous blood tinged discharge running from it.

The pupils are dilated, round, and about equal in size. The teeth are in bad condition, with abundance of sordes, and the mouth has some old and recent blood clot in it. The chest is long and narrow, with intercostal angle less than a right angle. The abdomen is scaphoid. Practically no panniculus. The muscles are deep red in color and show a moderate development.

Main Incision.—The peritoneum is moist, but there is no increase in fluid. The intestines are bluish brown in color and distended with gas. There are a few hemorrhages into the intestinal wall. The bladder contains a small quantity of urine,

but is below the pubis. The appendix is negative. The liver in the right nipple line is two centimeters below the costal border and four centimeters below the ensiform. The spleen is behind the ribs, but definitely enlarged. The diaphragm on the right and left extends to the fifth rib. The sternum is negative.

Thoracic Cavity.—The left lung is free, and there is no free fluid. The right lung is extensively bound down at the apex and over the base with old fibrous adhesions. There is a moderate quantity of pericardial fluid, which is clear and straw colored; volume estimated at forty cubic centimeters.

Heart is about the size of a fist, is bluish red in color and has numerous small bright red spots, in size from a pin point to two millimeters in diameter, scattered over the surface. The consistency is rather soft and flabby. The tricuspid valve admits three fingers, the flaps are negative. The pulmonary orifice admits thumb with ease, and flaps are negative. The mitral valve admits two fingers. The valve shows several thickened plaques, and in one point there is definite ulceration, with erosion completely through the valve—the hole measuring approximately three millimeters in diameter. The aorta admits the thumb with ease, and valves are negative.

Skull cap is rather thick, otherwise negative. The dura is firmly adherent to the arachnoid along the longitudinal sinus. On removal of the dura the brain has a wet edematous appearance, with marked injection of the blood vessels. In the right frontal region there is an area of hemorrhage which appears to be hemorrhage by diapedesis. The sinus was opened from the point at which it was incised at operation to the torcular heropholii. A small chicken fat clot was present, but no free pus. The jugular bulb was also examined and no pus was found. An opening was made into the middle ear, and the anterior wall was considerably necrosed, allowing the passage of a probe, which entered the sheath of the carotid in the carotid groove. When this probe was passed, considerable free pus drained out into the cavity. The probe passed down into the sheath and the point came out to the skin surface just below the tip of the mastoid, showing a burrowing subdural abscess in this location. The portion of the dura covering the cerebrum and cerebellum at the point of operation showed no granulation areas or abscess formation.

Lungs.—Both lungs are motley dark bluish to light red and congested at the bases. The right lung is somewhat firm at the apex, and on section numerous small white areas are scattered throughout, giving the appearance of tubercles.

The spleen is considerably enlarged, motley bluish red in color, and at the pole it contains a firm area. On section this area is white in the center with a hemorrhage surrounding it (infarct).

The kidneys are smooth, capsule strips with ease. On section the cortex is pale and distinctly demarcated from the medulla. At one pole there is a white area surrounded by a zone of hemorrhage—this infarct being about one and one-half centimeters in diameter.

The liver is slate colored, smooth and rather firm in consistency. On section the edges turn back and the color is uniformly light yellowish red. The lobulations are indistinct.

The gastrointestinal tract is negative.

(The microscopic sections have not as yet been run through, but the findings will be made out as soon as examined. The pathologic diagnosis below is based on the gross findings.)

PATHOLOGIC DIAGNOSIS.

Nature and origin of fatal illness: Streptococcus otitis media with secondary mastoiditis and subdural abscess (dissecting downward and outward). Secondary: Endocarditis of mitral valve with thickening and ulceration of vegetations. Old and recent infarcts of spleen and kidneys. Extensive thrombosis of capillaries of the skin with production of petechiæ. Thrombosis of capillaries of pericardium and intestine with petechiæ. General streptococcus septicemia due to streptococcus hemolyticus.

Historic landmarks: Old apical tuberculosis of right lung, showing some evidence of recent activity.

DISCUSSION.

Dr. Friesner said that he had seen this case with Dr. Phillips at the Post-Graduate, and clinically it was a typical case of sinus thrombosis. The operative findings, to some extent, seemed to bear out that diagnosis, although there was no clot. It was difficult to reconcile the postmortem and the operative

findings. Dr. Friesner said he had not had enough pathologic experience to know whether even a septic clot, in the bulb, for instance, might so disintegrate in six or seven days following a sinus operation that nothing could be found at postmortem. He did not know whether that was possible.

Dr. Guttman asked if the opening from which the pus came was in the middle cavity. While there may have been a septicemia present, it did not seem to be a typical sinus thrombosis temperature. If the pus broke through the inner surface of the tip and went down the neck, it may have been something similar to a Bezold mastoiditis.

Dr. Phillips said that he was not present at the postmortem, but the findings were that the anterior wall of the middle ear was necrosed and a probe passed down the carotid sheath gave vent to considerable free pus.

The primary operation was a very extensive one, the tip and everything possible was removed. Dr. Guttman was evidently laboring under a mistaken impression. It was not found at the sinus. It was the anterior wall of the bony wall cavity —the tympanic cavity.

Dr. Haskin said that Dr. Page had recently reported a case of hematogenous meningitis and cerebritis in which at autopsy no clotting was found in the sinuses.

Dr. Hubby said that the cardiac postmortem findings seemed sufficient to account for the temperature. It did not seem necessary to consider the sinus at all, so far as the explanation for the temperature was concerned. It would be interesting to know if there was any previous septic history to account for the old infarct of the spleen that was found at the autopsy.

Dr. Voislawsky told of a case to which he had not paid much attention at the time, so far as the postmortem findings were concerned. At the time of operation he had been obliged to resect almost to the torcular and remove the jugular; but at postmoretm no clot was found, nor anything remaining in the sinus. Dr. Phillips had spoken of "chicken fat clot." Dr. Voislawsky said he did not know what that was. Dr. Page had had a case in which nothing was found in the sinus—making three cases of this kind. This brought out a point that had never before been discussed in the section. What becomes of the clot? In our sinus operations a clot forms be-

hind the packing, and yet here are three cases in which there was no evidence of a blood clot.

DR. FRIESNER said that sepsis from an ear through the lateral sinus does not necessarily entail, in all cases, a thrombosis. The bacteria can go from an infected mastoid through the vein of the lateral sinus without any protection in the sinus at all—the usual protection in the sinus, the throwing out of the clot, need not occur. One of the points that might be emphasized was that given a badly infected ear and mastoid and a bacteremia, one should always consider—and seriously consider—the advisability of shutting out the venous stream from the ear into the general circulation, which means a sinus operation or exploration and ligation or excision of the jugular.

DR. SEYMOUR OPPENHEIMER said he did not think Dr. Friesner's viewpoint was correct—that one could have an infection of the blood stream without a thrombosis. One may have a parietal clot which is so small as to escape observation, as it may be washed out in the blood stream after incision of the sinus. In several cases that he had seen there was a positive blood culture and bacteremia, on the strength of which he had opened the sigmoid sinus, but failed to find the thrombosis; yet after that procedure a negative culture was obtained. He expressed the belief that in every case there is a thrombus, although it may be so small that it may not be recognized at the time.

DR. HASKIN asked how Dr. Oppenheimer accounted for failure to find it even at autopsy. Dr. Page's case had been very carefully examined and there was no clot.

DR. OPPENHEIMER said that he did not know how to account for it, but simply stated the above as a clinical impression based on experience.

DR. HASKIN expressed the opinion that in these cases there is an infection that takes place in the system, but does not take place in the sinus. Why may the infection not be carried out through other channels? They may communicate with various little ducts going through the anterior wall. These cases are probably much more common than is recognized. He had been very fortunate in his death records, having had only three. One of these was a child who was brought into the hospital in a comatose condition. He operated, but with-

out avail, and at the autopsy the whole carotid canal was filled with pus. One could not say where it went through the canal, but it seemed reasonable to suppose that it went through the middle ear itself. If one examines many bones, dehiscences will be found. Why should not an infection spread in this way as well as through a lateral sinus?

Dr. Phillips, closing the discussion, said that as far as the "chicken fat clot" was concerned, he could only say that that was the way the postmortem described it.

He had greatly enjoyed the discussion of this case. In many instances where he had operated on lateral sinus cases he had been disappointed in not finding any clot; in the majority of these cases the patients lived, but there was not any clot. In regard to this particular case, he did not believe that one otologist in fifty would have failed to operate upon it as a case of lateral sinus thrombosis. The patient died of the septic endocarditis.

Replying to Dr. Friesner's remarks, Dr. Phillips said that they had many times discussed this question together, but that he had come to the conclusion that this infection and bacteremia never went through the lateral sinus, but that it probably went into the circulation through the carotid canal.

Sinus Thrombosis Following Fracture of the Skull; Subsequent Acute Mastoiditis, Erysipelas—Operation, Recovery.

Dr. William Wesley Carter: The patient is a well developed man, forty-three years of age, a waiter by occupation. His family history has no bearing on his present condition. He denies specific infection. Is a moderate drinker. Two years ago he was struck over the head with a blackjack, but recovered entirely from the injury. On February 13th, while waiting for a trolley car, he was struck by a truck. He was brought to Gouverneur Hospital in an unconscious condition.

Examination.—Patient unconscious, skin over right eye swollen, and sclera of this eye ecchymotic. Pupils are unequal, the left being quite small and does not respond to light; the right is dilated. Colles' fracture of the right wrist. Profuse hemorrhage from right ear. A clinical diagnosis of fracture of the skull was made.

X-ray examination shows a linear fracture of the skull, right temporal region. The right frontal sinus is obscured, probably being filled with blood.

Three days after admission patient's normal mental condition became clear. Hemorrhage from the ear continues.

On February 18th, five days after admission, I was asked to see the case on account of the persistent hemorrhage from the ear. I advised irrigations with hot boric acid solution, to be followed by a solution of adrenalin dropped in the ear; also ice bag to the side of the head. Within twenty-four hours the hemorrhage ceased.

Patient's condition was apparently satisfactory until March 6th, twenty-one days after the injury, when he complained of very severe pain in his right ear, the ear from which the hemorrhage occurred. This pain extended down the side of his neck. The temperature, which had been normal since admission, began to rise and reached 105 degrees. The urine showed a large amount of albumin and some hyaline casts. Blood culture negative. Blood count: white cells, 11,500; polymorphonuclears, 76 per cent. There was no tenderness over the mastoid bone, but the tenderness over the upper two-thirds of the sternocleidomastoid was exquisite. The muscle was considerably swollen. The patient could not move his head, was in great pain, and begged piteously for relief.

Thinking of a probable sinus thrombosis, I decided to operate, though there were no classical symptoms of mastoiditis present.

The mastoid antrum and all of the mastoid cells, which were large and extensive, were found filled with clotted blood.

In view of the swelling and tenderness in the neck and along the course of the jugular vein, and the fact that the sinus showed almost black through its thin bony covering, I uncovered the sinus. It was dark blue in color, and on indenting it with a probe it did not resume its normal shape—evidently it was filled with a clot. I made an incision into it—there was no bleeding. I then uncovered about one inch of it, and with a pair of bayonet forceps I withdrew from the direction of the torcular a firm clot about three inches in length, which reached perhaps as far as the torcular. Free bleeding immediately occurred. The clot was composed in

its outer half of fibrin, showing, I presume, that clotting had occurred slowly and had proceeded from within outwards. After plugging the distal end of the sinus I succeeded in removing a similar clot from the direction of the bulb. So firm was this clot and so loosely adherent to the sinus walls, that it showed when removed the curve of the sigmoid sinus. In my exploration of the sinus and the adjacent bone I could discover no fracture. I then exposed the jugular vein, and finding that there was no clot below the entrance of the facial vein, I tied it. Cultures made from the clots removed from the sinus proved them to be sterile.

Shortly after the operation the temperature went to 106°, but in three days it fell by lysis to normal. The patient was relieved of his excruciating pain in the neck and became rapidly convalescent. At times he showed signs of mental aberration, and he complained of headache. I attributed these symptoms to disturbed cerebral circulation.

On March 23rd, two weeks after operation, the patient complained of pain in the left ear. Paracentesis was followed by a purulent discharge (streptococcus). Two days later tenderness and swelling developed over the mastoid. Temperature, 105°. Mastoid operation was performed on March 28th. The mastoid cells were all filled with pus. Culture showed a streptococcus infection.

Two days after the operation erysipelas developed around the mastoid wound; this spread over the side of his head. Temperature, 105°. Erysipelas was under control in five days, and since this time the patient has been slowly recovering, and he expects to leave the hospital in a few days.

Aside from the interesting features of this case, I feel that it is important to direct your attention to this class of injuries, very dangerous in their nature, sometimes extremely obscure in their symptomatology, and which may, as in the present instance, involve those parts in which we are especially interested.

DISCUSSION.

Dr. Hubby said that it was remarkable how seldom one sees a fracture of the temporal bone become infected. Many such fractures were brought to the Harlem Hospital, but in three years he had seen only one become infected, and that occurred

about two weeks ago. The mastoid was operated upon, and the patient had just gone home. The convalescence pursued the ordinary course following the simple mastoid operation for acute mastoiditis

DR. GUTTMAN asked where the fracture was. According to the X-ray plate the fracture seems to go through the frontal bone. That would explain the blood in the frontal sinus, and the fact that the other sinuses were also implicated. It would be interesting to know how Dr. Carter explains the infection of the frontal sinus infecting the mastoid. It is generally accepted that in fracture of the base of the skull with blood in the middle ear it is very unwise to i· te the middle ear, for such a procedure is apt to pro . infection. The doctors must never expect to see a s of the lateral sinus reproduced on an X-ray picture.

DR. DWYER said he believes that the .. najority of clots are nonseptic to start with—the clot is formed before the infection. In bacteriology it is well known that if fresh plates are used with the blood poured on at the ordinary temperature of forty or forty-five degrees, it will inhibit the growth of the organisms; therefore, at the Manhattan they never use these fresh plates. Time and again they have used negative blood plates that had stood only a few days. If the blood is mixed at fifty or sixty degrees to destroy the normal immune bodies present in normal serum, immediate growth is obtained.

We first have the clot in sinus thrombosis; we have a practically sterile clot; if the infection continues, we get liquefaction of the blood and infection. The large majority of clots are sterile. If enough bacteria get in and infection occurs and operation is not performed, all the pathologic changes follow —coagulation of the blood, liquefaction of the clot, and then infection of the clot and blood stream; but the big majority of the clots are sterile and remain so.

DR. HASKIN said he had never seen such a case—with the infection extending over the whole side of the head.

DR. DWYER said he has not seen any cases, but at the college there was a collection of pathologic specimens, and it was his impression that it was very rare for the Welch bacillus to go as far as in the case which Dr. Carter showed and not go further. The point made by Dr. Carter that the anaerobic

bacilli are carried by the blood stream and use up oxygen is not accurate, because it is not in a free state. The anaerobe has to take its oxygen from organized material or carbohydrates. The gas infections in the French Army, up to the time they started using modified vaccines, have been very fatal. Was Dr. Carter aware that it has been identified with the Welch bacillus? It has been very carefully studied and can now be easily identified.

DR. CARTER, replying to Dr. Guttman's inquiry in regard to the fracture, said that the fracture shown in the X-ray plate extends in the direction of the frontal sinus, and unquestionably goes into the sinus. The patient had bleeding from this side of the nose also, the blood coming, no doubt, from the frontal sinus. The fracture that caused the clot in the lateral sinus was at the base of the skull. An unusually large number of plates had been made in the effort to find this fracture, but it could not be identified on account of the numerous osseous planes at the base of the skull. Dr. Erdmann and other surgeons saw the case, and they all agreed that there was probably a fracture at the base of the skull.

In regard to irrigating the ear, the blood clotted in the meatus, and that was why irrigation was employed; but it was carefully done, there was no undue pressure, and little or no danger of carrying infection to the meninges. The expedient of dropping adrenalin in the ear and applying ice bags to the side of the head evidently stopped the bleeding, which was profuse and had persisted for five or six days. It occurred to Dr. Carter that the injury to the sinus might have been caused by contre-coup. This could have caused the thrombosis without there necessarily being a fracture at the base of the skull; this, however, was merely a surmise.

In regard to the clot itself, a very good pathologist had made two or three cultures and they were absolutely sterile. He also made a culture from the mastoid cells, which were all filled with clotted blood, and they were all sterile.

Dr. Carter said that there was one point upon which he would be glad to be enlightened. In this instance a sterile clot was removed from the sinus, the patient's temperature dropped from 106° to normal, and he became convalescent. Now, why should the temperature come down and the case continue to

progress favorably simply by substituting the clot which would form after plugging the sinus for the original clot which was due to the fracture?

In regard to the second case, that of gas bacillus infection of the mastoid, the pathologist was positive that he had identified the organism as the Welch bacillus. Dr. Carter said that personally he knew nothing about this, for he was not familiar with the bacteriology of the disease. His own idea in regard to the blood stream carrying the bacillus was that in cases which prove fatal it does not produce gas in the body until after death, and then there is a very rapid production of gas which makes the body swell. It is very unusual for the gas bacillus to cause symptoms so mild as in this instance. The patient, however, was only thirty-two years of age, was unusually strong, vigorous and healthy, and had good habits and a good constitution. Moreover, the distribution of the toxins through the body might have been limited somewhat, due to the locality which was infected.

Dr. Carter said that he had reviewed all the English literature bearing on this subject, and in only one instance did he find reference to the fact that gas bacillus might be found in the mastoid. There was not a report of a single case.

DR. HASKIN said that he thought Dr. Quinlan had reported a case after the Spanish-American war.

Cerebellar Abscess Complicating Acute Mastoiditis.

DR. ISIDORE FRIESNER: George C., seventeen years old, came to Dr. Phillips' clinic at the Manhattan Eye, Ear and Throat Hospital with an acute otitis media and mastoiditis (right) on September 19, 1916. A myringotomy was done under local anesthesia. Two days later he returned to the clinic. There was scant purulent discharge without odor coming through a good sized myringotomy opening in the posterior inferior part of the drum. There was no perforation elsewhere in the drum, although, on questioning the boy, he stated that the ear had discharged several times before the present attack. He had torticollis, held his neck rigid and his head inclined toward the side of the diseased ear. Pressure on the right sternocleidomastoid muscle, several inches below the tip of the mastoid, caused great pain. The mastoid was tender,

and there was slight edema of the overlying parts at the tip. He looked sick. Temperature, 102°; pulse, 100; respirations, 20.

He was admitted to the hospital and a simple mastoid operation was done at once. The mastoid was pneumatic and very extensive. The cells were filled with pus and granulations. The cells continued for quite a distance internal to the digastric groove toward the foramen magnum. Neither dura nor sinus was exposed.

The following day the temperature had dropped to 98.8° and the pulse to 90. He whined considerable, but made no definite complaint. He had no headache, ate fairly well, and his bowels moved normally. For the next four days the temperature ranged between 98.5° and 99.5°, pulse from 76 to 100. He slept well. A full dressing on the fourth day disclosed nothing abnormal in the bony wound.

Early on the morning of the fifth day he vomited, complained of headache and became very drowsy. Temperature, 99°; pulse, 40. Involuntary stool and urination.

Cerebrospinal fluid was not under tension, looked clear, contained a few pus cells but no bacteria, either on smear or culture. The blood count showed leucocytes, 26,000; polymorphonuclears, 92 per cent.

The pupils were equal and reacted to light. The eye grounds were negative. There was neither nystagmus nor conjugate deviation. The neck was slightly rigid. There was no Kernig. The abdominal reflexes were lost. Knee jerks increased—about equal. Bilateral Babinski; this was definite, but there was no Oppenheim, Gordon or ankle clonus. On account of the mental condition, pointing tests were impossible.

Exploratory operation (with very little anesthesia). The dura of the middle fossa was exposed first. It was normal. Then the posterior fossa was exposed, taking out the angle between the middle and posterior fossæ. The sinus and cerebellar dura also appeared normal. Somewhere between ten and fifteen minutes were consumed in exposing the dura. At this time respiration suddenly ceased. The cerebellar dura in Trautmann's triangle was hastily opened and a brain knife introduced into the cerebellum in a downward and backward direction. No pus. A pair of bayonette forceps were then

introduced, following the same direction which the knife had taken. The forceps entered the brain about one inch. A little over an ounce of thick, yellow, nonodorous pus welled rapidly out of the cerebellum. Stimulation, artificial respiration, pulmotor were all of no avail, and twenty minutes after respiration had ceased heart action also ceased.

The dura was examined over the lower portion of the cerebellum and over the anterior part as far inward as the internal auditory meatus. Macroscopically it was normal; there were no granulations and no exudate. The sinus, too, was normal.

Culture from the mastoid at the first operation showed short chain streptococci. Culture from the pus from the cerebellar abscess recovered the same organism.

DISCUSSION.

DR. HERZOG asked whether Dr. Friesner went through the original mastoid wound.

DR. FRIESNER replied that he went through the original wound.

DR. HELLER said that Dr. Friesner reported the case as one of acute mastoiditis, and yet said that the boy gave a history of having had discharges from the ear previously. Was it not possible that it was not an acute case but a recrudescence of an old condition?

DR. FRIESNER said that the boy gave a history of having had attacks of ear trouble with discharge before, but when he came to the clinic he had an intact drum. It was red and bulging; particularly in the posterior quadrant. A myringotomy was done under local anesthesia. He returned in forty-eight hours, and was again questioned; and he said that he had not had any discharge from that ear for along while, although it had previously discharged, but that each time he had had severe pain in the ear before it discharged. Frequently, where there is a permanent perforation, the ear discharges without pain. Here there was pain for two weeks, but no discharge. Not only did the history suggest an acute attack, but it was impossible to find any perforation except the one made for the relief of this attack. Moreover, the findings in the mastoid itself suggested an acute mastoiditis. It was a very pneumatic mastoid, with large cells which were full of pus and granulations.

DR. GUTTMAN said he believed it is an accepted theory that abscesses of the brain are formed by continuity—the pus extending from the mastoid to the brain. Considering that this was an actue case, did Dr. Friesner consider that the infection came to the cerebellum by infection from the middle ear in such a short time?

DR. FRIESNER said that while it is true that in many instances brain abscesses are formed by continuity, it was by no means true that all brain abscesses are so formed. He had seen a number of brain abscesses with normal dura and normal brain tissue between the abscess cavity and the dura.

DR. O'CONNELL, in reply to an inquiry as to the possibility of the patient being a hemophiliac, said that so far as he knew there was no such condition. The patient had recently had a submucous operation performed, and there was no trouble. Both drums were incised at the same time, and there was no trouble in the left ear, while from the right it was as stated. The patient was a healthy looking young man, only twenty-three years old.

DR. HASKIN said that it was not unusual to find the roof of the bulb in very excellent position to be punctured through the middle ear. In a number of specimens he had found the roof of the jugular bulb rise under the labyrinth and the promontory; and in many cases, if the bones are held up to the light, one can see dehiscences in that region, and in such cases the bulb might readily be entered if the incision were made below the foramen rotundum.

Otitic Meningitis.

DR. SEYMOUR OPPENHEIMER said that while there was nothing very unusual about the case, yet cases of this kind always form an interesting subject for discussion.

On April 14th he had been called to New Rochelle to see the patient, a man, fifty years of age, who had been suffering for several days with a slight suppurative discharge from the middle ear, spontaneous perforation having taken place with very few initial symptoms. During five days he had had a very slight head cold, with the highest temperature recorded being 100.5°. On the fourth day he was practically discharged by his physician, with instructions to report in a few days.

On the morning of the fifth day he had a chill, and in the afternoon a temperature of 104°, a double Kernig and a rigid neck. There was no tenderness on pressure over the mastoid. It was decided to operate, and the mastoid cortex was found to be very thick, which accounted for the fact that there was no external tenderness on palpation. During the operation a lumbar puncture was made, and the fluid was found under pressure and extremely turbid. While the patient was still on the table a smear was made from the fluid and examined under the microscope, and showed a large increase of the cell count, but morphologically nothing was found suggestive of bacteria. Dr. Oppenheimer said that he did not perform a cranial decompression operation, although he certainly would do one the next time he had a case of otitis disease with meningitic symptoms and turbid fluid. A number of white mice were injected intraperitoneally with the cerebrospinal fluid. In this way determination could be made quickly as to whether they were dealing with a bacterial or a nonbacterial meningitis.

On the following morning the patient's condition was somewhat improved, and all the cultures taken and the white mice inoculations failed to show any organisms, so that they were inclined to feel that the meningitis was not bacterial. In the afternoon, however, the patient's temperature rose rapidly and the evidences of meningitis became more marked. He was accordingly placed on the table again and a decompression operation was performed.

Dr. Oppenheimer said that this was the last time he would ever attempt a subdural drainage by this route, as it does not drain the subdural space but for a very short time, but he would in the future rely on decompression and lumbar puncture rather than subdural drainage. Some smears were made and morphologic evidence of some organism was found, but it could not be identified, although it was believed to be a streptococcus. More white mice were injected, and in six hours they showed the evidence of a streptococcus mucosus infection. An interesting point in this case was that the operation was performed evidently just between the serous and the purulent stages of the meninigitis. Another point was the seriousness of all these cases of streptococcus mucosus infection. They may well be called "a thief in the night." This

patient's otitic symptoms were very mild, yet he had this rapid flare-up, the development of meningitis, going from bad to worse and succumbed in a very short time.

Dr. Oppenheimer said that in this case he had withdrawn a quantity of blood from the vein of the arm of the patient, getting about ten cubic centimeters of serum from the blood and having this injected into the spinal canal after the spinal puncture. The serum of the blood contains the antibodies and forms the theoretical basis for this method of procedure. It had occurred to him that it might be feasible to keep track of these streptococcus mucosus cases—cases that have recovered from an acute mastoiditis or otitis—where this particular type of infection had been present, and utilize the antibodies of their blood for introduction into another patient, in the same manner as this plan of procedure has been used in cases of poliomyelitis.

DISCUSSION.

Dr. Heller said that as Dr. Oppenheimer mentioned he had operated upon the case between the serous and the purulent stages of meningitis, he would like, in this connection, to make a preliminary report on a case which had been admitted to Lebanon Hospital last week with a diagnosis of meningitis. The patient, a boy, was practically unconscious when he was brought to the hospital, and had a temperature of 105.8°. Lumbar puncture was performed and fluid under great pressure was removed—five hundred cells per cubic millimeter. The fluid was sterile. The medical men were convinced that it was meningitis and nothing else. He had Babinski and all the other signs. It was learned that he had been operated upon a year before at the Manhattan Eye, Ear and Throat Hospital for some ear trouble, and that there had been a discharge ever since. The boy was in a desperate condition, and while there was very little hope, yet it was thought best to operate immediately. It was found that a modified radical operation hal been performed. The posterior wall was gone, but the ossicles were still present. The tympanic cavity was opened and cholesteatoma was found. When the roof of the antrum was opened the dura bulged through the opening. This was incised and drained. The next morning the temperature was

down to 101° and the boy was conscious. Then it rose to 102° on the third day and the boy had pneumonia and showed pneumococcic serum in the blood. He is still alive with an active pneumonia.

DR. HASKIN said that these cases are very puzzling, and then cited the case of a patient on whom he had recently done a mastoid operation. She had been operated upon seven years previously, but suffered constant pain, and it was finally decided to reopen the ear on account of this pain. Later, she started a temperature, and it continued at 105° to 107.2° for about fifteen days. She looked sick, and yet all the indications were against doing anything. She went from 25,000 leucocyte count to 8,200, and showed a very interesting blood series. The girl had absolutely no clinical symptoms; all the reflexes were negative; Wassermann, typhoid, and tuberculin complement fixation tests were also negative. The patient was very sick, and the family wanted him to operate, as did also the family physician. He refused, however, and they decided to take her to the Neurological Hospital, carrying her out with a temperature of 106°. It was only a few blocks to the hospital, and when she was admitted there her temperature was normal, and never again went over it. The only way to account for it was that she had had a basilar meningitis. She had a partial facial paralysis, appearing three weeks after operation, but they had hesitated to do a lumbar puncture—for Dr. Rae had done one under somewhat similar circumstances and later a decompression operation, but the patient had died, and he advised against lumbar puncture. When it came to the 20th of March and everyone thought she was going to die, a lumbar puncture was made to keep the record complete; twelve cubic centimeters were withdrawn and replaced with normal saline. The fluid was absolutely normal chemically, cryptologically, and bacteriologically. Whether that had anything to do with relieving the pressure no one will ever know, but the temperature dropped in a journey of a few blocks and never went up again.

DR. HERZOG asked if Dr. Oppenheimer had used Hiss' extract.

DR. SEYMOUR OPPENHEIMER replied that he had not used Hiss' extract intraspinally, but had injected urotropin. The

last case so treated had had some very violent convulsions following the injections, and he believed the end was hastened. If his understanding of the benefit to be derived from urotropin was correct, it must be introduced or secreted through the cerebrospinal fluid. The profession unfortunately must admit its helpless position when confronted with such cases.

DR. HASKIN said that urotropin has to be acted upon by an acid to generate formalin, and he could not understand the rationale of introducing it into the spinal fluid.

Gas Bacillus Infection in a Chronic Mastoiditis With Cholesteatoma —Operation, Recovery.

DR. WILLIAM WESLEY CARTER: The patient, a large, powerfully developed Russian, thirty-two years of age, was admitted to my service in Gouverneur Hospital, March 16th. Family history is unimportant.

Aside from the ear condition leading up to his present illness, patient has always been strong and healthy, and says that he was never really sick before in his life. He denies venereal history, and says that he neither drinks nor smokes.

Following an attack of la grippe two years ago, he had an abscess in his right ear. At intervals since this time he has had pain and a discharge of pus from this ear. He has never received treatment for this condition. At times the pain in his ear has been very great, but it has always subsided after a profuse discharge of pus.

For three months he has had a bad cold in the head, and for the past month he has had almost constant pain in the right ear. Several days ago the discharge from his ear increased greatly. On the day before his admission to the hospital he had a chill, followed by fever and sweating. The tissues around the ear became swollen and painful, and this condition gradually extended over the whole side of his face and head.

Examination shows the following condition: General appearance of patient is that of a very sick man. Temperature, 102°; pulse, 90; respirations, 24. Right side of the face is paralyzed, right eye almost closed, entire right side of face, neck and head greatly swollen, and skin is dark red in color. The limit of the swelling is fairly distinct, but it has not the prominent line of demarcation characteristic of erysipelas;

then, too, the swelling is bulging in character, the most prominent point being over the mastoid antrum. There is a foul, purulent discharge from the right ear. No attempt was made to inspect the drum, as the canal was closed by the swelling. On account of the pain and swelling the patient can scarcely open his mouth wide enough to take nourishment. The entire swollen area is very painful to the touch. Firm pressure with the fingers gives a sense of fine crepitation, which is combined with that of fluctuation over the mastoid. Blood examination: White cells, 12,000; polymorphonuclears, 78 per cent.

Operation.—The usual incision for mastoiditis was made. As soon as the knife penetrated the deep layers of the skin a most unusual phenomenon was observed: the blood oozing from the wound appeared to be charged with gas which was escaping in fine bubbles. The incision was made fully an inch and a half deep, through the edematous emphysematous tissues before the periosteum was reached; as soon as this was incised there was an almost explosive discharge of foul smelling gas, followed by thin fetid greenish yellow pus. The odor of this discharge was said by all of those present to be identical with that of other cases of gas bacillus infections treated in the hospital.

Subperiosteal elevation of the tissues extended over the entire right side of the head.

There was a large perforation in the mastoid cortex at a point corresponding to the antrum. The entire mastoid process with the exception of the extreme tip was occupied by a cholesteatoma which extended also into the middle ear. The posterior bony wall of the auditory canal was completely destroyed.

The small vessels lying upon and entering the bone over the entire affected area presented a very unusual appearance—they were thrombosed and resembled fine black hairs.

The cholesteatoma and the tip cells, which were filled with pus, were thoroughly removed, and all overhanging bone was curetted away. Free counter openings for drainage were made through the scalp; one near the parietal eminence and one near the occipital protuberance. The wound was irrigated with hot normal saline solution and packed with iodoform gauze.

A culture made from the wound pus showed a mixed infection, including large numbers of giant rod-shaped gas bacilli. These bacilli are Gram positive, are about 5 p. in length and about the thickness of anthrax bacilli. They correspond to the description of the Welch bacilli, which have been described by Nutthall, Flexner, and others.

Following the operation the patient showed almost immediate improvement. The temperature in two days dropped to normal; his recovery was uneventful, and he was discharged from the hospital on April 5th, nineteen days after admission. The wound has since healed entirely.

The gas bacillus is anaerobic; it cannot live in oxygenated, circulating blood. It would seem, therefore, that an old cholesteatomatous mastoid would offer ideal conditions for its propagation where once it has gained an entrance.

Interesting features of this case are:

1. The rarity of gas bacillus infections of the mastoid.

2. The unusual route through which the infection gained an entrance—namely, through the middle ear. The usual mode of entrance of this bacillus into the body is through an open wound or abrasion into which earth has been ground.

3. The prompt recovery following the operation: an unusual sequel to gas bacillus infections, for these cases usually succumb very quickly.

Profuse Hemorrhage From the Middle Ear Twenty-four Hours Following Incision of the Membrana Tympani.

Dr. Joseph H. O'Connell: On December 14, 1915, Abraham W., aged twenty-three years, was admitted to the Post-Graduate Hospital suffering from severe pain in both ears. Nine days previous to admission a submucous operation had been done. On the morning of his entrance to the hospital he was awakened by a sharp pain in the left ear; a few hours later pain lighted up in his right ear.

On admission his temperature was 101°; pulse, 100; respirations, 24. Examination of the ears revealed drums acutely inflamed and bulging. A double paracentesis was immediately done under gas anesthesia. The smear which was taken and later examined showed a streptococcus hemolyticus infec-

tion of both ears. The following morning the patient was very comfortable.

On the afternoon of the second day he began to bleed from the right ear. The bleeding started suddenly as he was lying quietly in bed. When I saw him blood was flowing freely and several towels were well saturated. The blood was dark in color, and a large clot was protruding from the meatus. No blood appeared in the pharynx. After thoroughly cleansing the canal I could distinctly see the blood oozing through the incision which had been made in the drum. As soon as it was wiped away it immediately reappeared. There was no pulsation. Slight pressure with cotton on an applicator was sufficient to stop the flow. A small strip of gauze was packed against the drum and this readily controlled the hemorrhage. On the following day the gauze strip was removed, and although the ear continued to discharge for some time after, there was no recurrence of the bleeding.

Profuse hemorrhage from the middle ear in adults following incision of the drum is not very common. It is more likely to occur in infants and very young children because the bulb, which may be high up, is not protected by firm bone, or a dehiscence in the bone may still persist.

In my case, the wall of the bulb may have been injured through a dehiscence during the paracentesis and later it ulcerated through. The only other source of profuse hemorrhage in this region would be from the lateral sinus. But to injure the sinus through the middle ear is not at all probable unless an anomalous condition exists.

NEW YORK OTOLOGICAL SOCIETY.

Meeting of November, 1916.

Neoplasm of the External Auditory Canal Treated by Radium.

DR. HARRIS: About three years previously the patient was seen for the first time, when he complained of a slight discharge from his ear. At that time the condition was about as follows: The drum could be seen, there was a discharge in the canal, and he had superficially all the landmarks of chronic suppuration of the middle ear. The fork tests showed absolute destruction of the labyrinth. Dr. Harris could get no response whatever. The patient had an impression that he heard, but the speaker had never been able to discover that he had any hearing in the affected ear. In the canal there was a mass which suggested granulation tissue, which bled very easily when probed. Dr. Harris had the patient under observation for about one month, at which time the pain of which he complained rather increased, and he also had several spontaneous hemorrhages. At that time, a month after the beginning of treatment, an X-ray picture was taken of the mastoid, and interpreted by Dr. Law, who said there was a spot of disease and pus in the mastoid antrum. The patient was advised to have an operation performed at that time. This was three years ago in April. Dr. Harris went into the mastoid and, assisted by Dr. Haskin, found a healthy mastoid, but when they opened up into the canal and attempted to remove the mass which was there, they encountered such tremendous bleeding that, after getting out a small bit of the growth, they were compelled to desist. This was submitted to the pathologist at St. Luke's Hospital, who reported it, so far as he could determine from the small piece submitted, appeared to be a malignant growth. The case was kept under observation. There was no return of the growth whatever, and the patient went back to his profession, that of clergyman.

The next time Dr. Harris saw him, about one year later, he returned with no complaint about the ear, but paralysis of the left vocal cord, which was absolutely immovable, had devel-

oped. That condition was giving him distress because he could not speak. Six months later, in the spring, he presented himself with the complaint that his ear was again giving him trouble. At that time Dr. Harris found the canal completely filled by a new growth. This was giving him some pain, and what was evident on his presentation before the society was more in evidence then. There was a facial paralysis, involving the eyebrow and muscles of the face on the left side. Dr. Whiting saw the case in consultation, and the question was considered how thoroughly the tumor could be eradicated. Dr. Harris felt that before proceeding to this very radical procedure he would try something less radical.

Last spring the patient received eight applications of radium at weekly intervals, and four this fall, making altogether twelve applications. There had been a very noticeable diminution of the growth. It began in the canal, and had been entirely flush with the outer entrance of the ear. The symptoms disappeared. The patient had informed Dr. Harris the day previous, and he was satisfied he was getting decidedly more power over the facial muscles, and while there was as yet no movement of the vocal cord, there was without question movement of the left arytenoid cartilage. The patient had been able to pursue his occupation of clergyman in a very large church in town without losing a single day. He felt perfectly well, and had full weight and strength.

Dr. Harris said the members might ask the question why he did not confirm the diagnosis of the pathologist by another section, but he simply felt it unwise to take any nances of hastening the growth by taking out a sufficient section of the tumor to make a correct diagnosis. He thought the case was interesting in connection with the rather extensive history, the involvement of the cord and the facial muscles, and the effect of the radium as it had up to the present time been demonstrated. The use of the radium had been entirely without any unpleasant consequences, and there had been no reaction at all. The applications had been from about twenty to thirty minute periods. Dr. Harris said that he remembered a case which had been reported by Dr. Wilson, of Bridgeport, a number of years ago, where radium was used with equally beneficial results.

DISCUSSION.

DR. QUINLAN said he would like to ask whether any part of the growth adhered to the canal wall, especially the anterior and inferior part.

DR. HARRIS said that when the case was first seen by Dr. Haskin, they thought they were dealing with an abnormal condition of the jugular bulb. The Wassermann reaction was negative, and the picture of the chest also.

DR. MCKERNON said he would like to ask how many treatments of radium this patient had had, and at what intervals.

DR. HARRIS said the treatments had been given at weekly intervals, eight last spring and four in the month of September.

DR. MCKERNON said he would like to know if the mass in the canal had increased in size or changed in color.

DR. HARRIS said there had been a shrinkage of the condition since radium was used from last May. The improvement had been observed by a half dozen men who had been following the case from that time.

DR. MCKERNON said he would like to know the pathologic report. He had seen two cases, one external and one in the canal, very similar to Dr. Harris' case. In this case radium was used, and while there was a distinct cessation for a period of several weeks in the one case, and a period of several months in the other, they both had recurrences and died.

DR. PHILLIPS said some of the gentlemen present might recall the case of epithelioma which he showed before the society. In that patient the primary growth was in the floor of the canal, and a general practitioner had considered it a mastoid case and had operated on it. Later he had been obliged to reopen and clear out the entire area, which had then become involved. Dr. Abbey used radium on this case, and she suffered excruciating pain following its application. It never produced any effect on her, and the speaker did not know how many applications she had received, but thought three, four or five.

DR. BERENS said he would like to know if that mastoid was open when the patient received the applications of radium.

DR. PHILLIPS said this case was rather unusual. If the case

presented was one of eipthelioma, it would be the youngest he had seen. The woman he showed was about thirty-nine or forty years of age, and had been the youngest he had seen. Clinically this case did not look like epithelioma but more like sarcoma.

Dr. Haskin said if he was not mistaken, the pathologist at St. Luke's Hospital stated at the time of the report he was unable to say positively whether the piece of the growth removed by the forceps was malignant or not.

Dr. Toeplitz said one interesting feature in this case was the paralysis of the left recurrent laryngeal nerve. The only explanation seemed to be that there was a metastatic growth which should be followed out, otherwise he could not see how the recurrent laryngeal nerve could be affected, since this nerve only went up as far as the omohyoid muscle. He remembered a case which he had seen with Dr. MacDonald, in which it had been difficult to make a diagnosis; the paralyses of the facial and of the laryngeal recurrent could only be explained by a carcinoma of the esophagus and a metastatic growth pressing on the facial, after it had passed the foramen stylomastoideum, from which the patient died three months later.

Dr. Berens said that while the patient was under observation he had asked Dr. Harris whether a Wassermann test had been made, and was told that there were three made, all of which were negative. The paralysis of the vocal cord, it seemed to the speaker, could be explained on the lines of syphilis in connection with this growth. There might be a syphilitic neuritis. Cases of syphilitic neuritis of the recurrent laryngeal nerve are not uncommon, and clear up very quickly under proper treatment. He had seen at least three, probably four or five, cases of syphilitic paralysis clear up under mercurial treatment before salvarsan had come into use, and two cases cleared up rapidly from the use of salvarsan.

Dr. Duel said that although all three Wassermann reactions had been negative, if syphilis was responsible for the growth, a positive indication might be obtained by spinal puncture and examination of the fluid. Many of these cases would not give a positive Wassermann reaction by blood test. The speaker had seen a case only that week in which there was undoubtedly

syphilitic involvement of the eighth nerve, where examination of the blood failed to show a positive Wassermann reaction.

DR. BERENS said he was very glad that Dr. Duel had brought out the point about spinal puncture in regard to the negative Wassermann reaction.

DR. QUINLAN said the growth looked malignant in nature. Dr. Schwartz had told him a number of years ago that probably fifty per cent of the growths springing from the canal, and especially from the anterior and inferior canal wall, resulting from chronic suppuration, had more or less of a malignant aspect. The speaker, in his judgment, would be inclined, even without a microscopic examination, to term it malignant. The paralysis of the left vocal cord he did not quite understand about, as there was no evidence of infiltration or inflammation about that cord.

DR. HARRIS said there was absolutely no infiltration or inflammation about the cord.

DR. QUINLAN said if this was a malignant growth, was embedded in the tissue, and macroscopically had the appearance of a malignant growth, the main line of argument would tend towards the specific element of the disease. This growth in the canal had the appearance of a mixed growth, involving also the cutaneous structure and mucous membrane. He did not touch it, therefore could not tell how much resiliency was present.

DR. HARRIS said that the growth was very vascular, and that he had no further examination made since the one originally made at St. Luke's.

DR. QUINLAN said he had seen two such growths. One protruded externally in a man seventy-one years of age, who had had the growth for over fifty years, and had been advised by several surgeons not to have anything done. It was probably one of very serious nature, and ordinary manipulation by examination caused profuse hemorrhage. A small piece had been removed, and on examination it was found to be a benign growth. A postauricular incision was made, which showed it to be adherent to the posterior and inferior canal. This operation took place three years ago. Dr. Quinlan saw the man about four or five months ago, and there was no evidence that the condition had returned. The other case he had

seen in Halle with Dr. Schwartz, who emphasized particularly the importance of a malignant diagnosis in growths springing from the canal wall. Dr. Quinlan said he would like to ask Dr. Harris to report subsequently on the case, and also the condition in the larynx.

DR. HARRIS said the patient was originally treated for his ear, and the paralysis then occurred, one and one-half years ago. The voice was now perfect by usual compensation of the other cord, and the man was able to preach.

DR. EAGLETON said he had brought with him some X-ray plates to show metastatic carcinoma of the temporal bone. He wanted to ask Dr. Harris if he had any X-ray plates taken since the original X-ray. Since the first report of his own case findings, about two years ago, there had been so much progress in X-ray interpretation that he thought if Dr. Harris would have an X-ray taken now, it might throw great light on the nature of the growth itself.

DR. BERENS said he would like to suggest to Dr. Harris, if this patient objected to lumbar puncture, that no possible harm could result from the use of salvarsan. It was simply a point in the therapeutics and might substantiate the diagnosis.

Mastoiditis With Eczema and Atresia.

DR. HARRIS said this case was simply illustrative of what is occasionally met with in these cases, and he wanted the gentlemen to see the picture presented. The patient, a young girl, had been under his care in the hospital for her nose and throat. There was a general eczema and an empyema of the antrum, frontals and ethmoids, which condition was now virtually well. She showed a suppurative process in her right ear, upon which a mastoid had been performed. In the left ear there was almost complete obstruction. The atresia did not permit the entrance of the finest probe he could use. A simple mastoid had been performed and later a radical operation. The gentleman who had performed it thought that the atresia had followed the simple mastoid. This case suggested the question regarding the propriety of doing anything to better the atresia. She had absolute loss of hearing in the left ear, and both vestibular and cochlear labyrinth were dead. She was still having a rather free discharge from the left ear and also from

the right. The question was more than an academic one, because where there was secretion she had eczema.

DR. PHILLIPS said he would like to ask if there was any history of a period during which this patient had an active labyrinthitis.

DR. HARRIS said there was no history of any data of a period during which this patient had active labyrinthitis. There was a dead labyrinth on the left side, but the trouble which required radical treatment was in the right ear. He said he could not get a probe through, but there must be a minute passage there, for the ear discharged freely on the right side.

DR. BERENS said the point to be particularly talked about was whether they should operate on the ear which was suppurating but could hear. The other ear was dead. The question to be decided was whether a radical operation should be done on the first ear.

DR. HARRIS said he thought that this case was deserving of a very free discussion.

DR. QUINLAN said that the condition of this canal confirmed him more than ever in the thought that they should never allow anyone else to follow out their subsequent line of treatment after a mastoid operation. He remembered two cases where he had allowed the family physician to follow up the treatment by dressing the wound. Sometimes in these operations the assistants, in their zeal and enthusiasm, would drag the ear anteriorly. If the ear is not kept well back and upward, and support given to the upper posterior wall, there would be this relaxed condition. If they allowed the family physician to continue on the cases, they would get this stenotic condition, as has happened in the case first presented. Although there was no suppuration in his cases, one a boy and the other a girl, still there was a band of cutaneous tissue inside the scaphoid fossa between the drum and external orifice.

DR. DENCH said that an excellent meatus could be formed by a perfectly simple plastic operation. He stated that he would turn the ear forward and make the ordinary Dench flap. Undoubtedly some other form of flap would do equally well. He did not believe that there would be much danger of infection of the flap if the ear were kept thoroughly cleansed prior to the operation. It was to be remembered in these cases that

local infection was not apt to occur, as the tissues of the patient were already pretty well fortified against such an infection. He would hesitate to do a radical operation on the ear which had the best hearing, but would suggest the plastic operation as a primary procedure. If the suppuration stopped, well and good. If not, he believed that a careful radical operation would effect a cure without much menace to the hearing. He would certainly do a radical operation upon the ear in which there was no hearing.

DR. MACPHERSON said he would like to know if any of the gentlemen present had tried the new Dakin solution on any of these cases, which had been used so much in France for wound infections. He used it in two cases. One, an intermitting discharging ear, cleared up, but it had done so previously by another treatment.. In the second, a granulation about the size of a pea, springing from the region of the attic, dried up after destroying it with one application of silver, followed for about ten days by the use of the solution.

DR. LUTZ said that he had used this Dakin solution to which Dr. Macpherson referred, in the middle of the summer, and found that in discharging ears it did very well. He dropped it in just as one did peroxid.

Presentation of Specimens of Labyrinth and Fetus.

DR. MCKERNON showed two specimens for their beautiful mounting, which had been placed in a fluid. One showed a labyrinth very distinctly, and the only part which he wished to know about was the nature of the fluid, which was a secret one. He had obtained the specimens in Leipzig, and had been told that the temporal bone and labyrinthine structure was simply put into this fluid. The other specimen was a fetus. They had received no previous treatment whatever. He saw a large number of such specimens in the laboratory at Leipzig and had picked out these two. The tissue was taken off and they were then placed in jars.

DISCUSSION.

DR. DENCH said that he had seen several specimens from this same laboratory. He wished to know if the bone had not been decalcified first. In his opinion, the bone had first been decalcified and then dropped into the preserving fluid.

Dr. Berens said that Dr. Duel and he had done some similar work in 1904 or 1905, and the bone then was first decalcified, although these specimens were said not to be so treated.

Dr. Lutz asked if at the laboratory they had given Dr. McKernon the length of time it took to bring the specimens to that stage.

Dr. McKernon said they had not given him the length of time it took to bring the specimens to this stage at the laboratory. They must have had about fifty on the shelf, and these were put in the solution just the same as the two specimens he presented.

Carcinoma of Temporal Bone and Mastoid, and Presentation of Other X-Ray Plates.

Dr. Eagleton: The first plate taken was of an old gentleman, about seventy years of age. Fifteen years previously he had had a cancer of the lip, which was removed in the regular way, and then epithelioma of the side of the nose, which was removed by snow. He later had an epithelioma of the ear, which was excised. The one of the lobe of the ear and one on the lip were pronounced as basal cell epithelioma. Eight months after the last removal, he noticed he was becoming deaf and had a buzzing in his ear. Two months later he developed dizziness and nystagmus of the left side. Six weeks later there were a few drops of blood and pus from the ear without pain. The local physician diagnosed the case as one of abscess, but as the patient had no recurrence of the discharge and no pain, he refused the diagnosis and went to an aurist, who inflated him.

When first seen by Dr. Eagleton, about two months previously, he had a small granulating mass occluding the posterior wall. He was totally deaf, the vestibule did not react to the caloric test, and there was slight facial paralysis. Pressure over the mastoid, which was not tender, made him dizzy. An X-ray of the two mastoids was made stereoscopically, and the speaker said they ought to be seen that way to be properly appreciated. The diagnosis by the radiographer was carcinoma of the temporal bone, involving the whole mastoid region. Nothing could be seen by Dr. Eagleton except the small mass springing from the posterior wall. He made a

large incision and found the skin perfectly normal. He then exposed it and found both the inner and outer plate filled to the dura. The wound healed by primary union, but three days previously the facial paralysis had become complete. The case was remarkable because it showed a metastatic bone carcinoma and not a primary carcinoma. which was so frequently seen. He had the primary growth there, and it was a metastasis not by direct extension. In looking over the literature on the subject, in the textbooks of otology, the speaker said they always mentioned the form of carcinoma which grew by extension and not metastasis. The rarity of the condition had caused him to look up the literature, and he was rather thoroughly surprised to find that only two-tenths of one per cent of skin carcinomas ever caused metastases of bone. Primary carcinoma of the thyroid, adrenals and kidneys caused a large number of bone metastases in different parts of the body. Those of the thyroid and prostate very frequently gave metastases of the skull and temporal bone.

The diagnosis in these X-ray plates was so interesting that the speaker went through some of his old plates. In regard to syphilis, he had some time ago had a woman under his observation who presented herself with what was thought to be a frontal sinus involvement. The X-ray plate taken demonstrated that she had a cranial syphilis just above the eye, although, according to her physician, he would not put it in its proper place. The erosion of bone looked very much like an osteomyelitis. It could be pretty correctly diagnosed as of a granulomatous nature and a diagnosis of syphilis was made. Up to the time of the radiograph there had been no suspicion of it. She was practically going to be operated on in the frontal sinus by a New York physician when the X-ray was taken and a dose of salvarsan cured her.

Another plate showed a case of slow growing carcinoma of the antrum, and the blood was examined. A careful diagnosis was made by the radiographer, who stated the patient had periosteal spicules growing in irregular form in the growth itself. The speaker said it should be stereoscopically seen to be appreciated.

Another plate presented a rather rapidly growing sarcoma of the sphenoid. The difference between two X-ray plates

could be seen. In the one there was no bone formation whatever. The man died, and the sphenoid and cranial cavity were found involved.

Another plate showed a new bony formation and tumor formation, which resulted from continued suppuration, and was a case of hemorrhagic periostitis. It was opened up and a section removed, from which a pathologic diagnosis was then made.

Dr. Eagleton said the case he wished discussed was that of the carcinoma. He suggested that if Dr. Harris had an X-ray taken now of the case he showed at the present time, no mistake would be made, and it would probably be found to be a rapidly growing sarcoma or carcinoma—likely a carcinoma.

DISCUSSION.

Dr. Haskin said he wanted to speak of the spicules in the floor of the antrum which Dr. Eagleton mentioned. The speaker was rather interested in some specimens shown by Dr. Cryer, who would take up a skull and state that it was a syphilitic skull from the peculiar formation of the inner surface, especially its anterior middle fossa. There were stalactites sticking up all through the surface of the bones. He showed Dr. Haskin about fifty specimens of his own, which he said were undoubtedly syphilitic. It was rather interesting, because the speaker, in his own recollection, had had three or four specimens in the sphenoid sinus, where from ten to fifteen stalactites were sticking up from the floor of the sphenoid sinus. He did not know what the history of these patients had been, or whether they would show up in an X-ray picture, but they were very marked. Dr. Mosher stated he had seen one or two spicules in such cases, but never such a collection in any one sinus.

Dr. Harris said he was sure Mr. King would have another X-ray picture taken and he would report the case at a later time.

Stenosis of Ears by Shock.

Dr. Quinlan said he wished to report a case he had seen at St. Vincent's Hospital, about three weeks previously, directly after the Hughes celebration in this city. The patient, a young man, was enthusiastic about getting a picture of Mr. Hughes,

and had set his camera for the same. By some improper provision the spark, used in connection with his camera, blew up and the boy was thrown to the ground. He lay there unconscious for several minutes, when he was picked up and brought to Bellevue Hospital.

Dr. Quinlan saw the boy the next day, and found that both eyes were closed and it was impossible for the patient to open them, although by force some argyrol was put between the lids. The external auditory canals of both ears were absolutely stenosed. The skin was swollen, and it was only by using force that the drums could be seen, and then only partially. Both drums were torn, the boy could not hear, and, as he could not see, did not know what had befallen him. He went on in that condition for some time. The speaker saw him again a few days subsequently. All his symptoms were cleared up and the drum membranes were now plainly visible. There was no congestion or flush of inflammation about them.

The shock had been so intense as to do so much damage, and yet repair had taken place within a very short time. The boy now heard a whisper at a distance of four feet. The ears were in fairly good condition, except that he had more or less tinnitus, which was troublesome, especially in the left ear. The drum in this ear was still open in one place and the rent showed up, and there was an area with a slight inflammation around the aperture which was subsiding. It was rather curious to have found the eyes and ears in such an awful condition following shock.

DISCUSSION.

DR. BERENS said he would like to ask Dr. Quinlan whether the upper tone limit in this case was lowered.

DR. QUINLAN said that the upper tone limit in this case had been lowered, but that it had come back.

DR. HARRIS said he would like to ask Dr. Quinlan whether he had recognized any labyrinthine condition in this case. He made the suggestion, because a large number of such cases were presenting themselves abroad, as the result of shell explosion in the great war. These cases were the result either of direct concussion or of injury. The former were apt to get well. The latter of course remained permanently deaf.

DR. QUINLAN said that he had at first thought the shock might have caused extravasation of blood in the labyrinth, but on account of the rapidity of the clearing up process he was inclined to think it resulted only in mere concussion.

DR. DENCH said he thought the concussion due to explosion was the cause of the impairment of hearing and lowering of the upper tone limit. He asked if there had been any facial paralysis. Continuing the discussion, Dr. Dench said that he understood that the external auditory meatus was found closed, and would like to ask by what. He asked if the camera blew up and set fire to the film.

DR. QUINLAN said that external trauma closed the ears. The condition looked like an extensive erythema. On the whole, the features could not be distinguished at all. There was an extensive burn affecting the entire cuticle. In trying to get the picture he had been thrown from his position by the explosion. Dr. Quinlan said he did not know what caused the accident. The patient said it was probable that some sparks dropped in the pan attached to the camera, and his only regret was that he could not replace his camera, as the one destroyed came from the other side. There had been no facial paralysis, and the patient was all right now, except for a slight perforation in the left drum membrane.

Two Cases of Mastoiditis With Staphylococcus Organism.

DR. PHILLIPS said he wished to report two cases which he had seen this fall. The first was in a man, sixty-five years of age, who had come from Montana, who had a large postauricular abscess and all the evidences of advanced mastoiditis. In the latter part of May, in some way, a spiked grass, known as foxtail, had gotten into his canal and injured the ear drum. A day or two afterwards there was a discharge. A paracentesis was done. There was continuous discharge from then up to the time Dr. Phillips saw him. He complained of mastoid pain, but the suffering had not been severe. The local otologist who cared for him did not consider the case one of mastoiditis, but at the time the man left he had no postauricular swelling. The speaker operated on him, and at that time, of course, he had tenderness as a result of the periostitis. The

entire mastoid process was found involved and full of granulation tissue and pus throughout the entire area. The tegmen was absorbed and quite a large area from the knee of the sinus. The interesting point in this case was that examination of the secretion from the ear showed it to be a staphylococcus aureus.

Dr. Phillips said he would not have been so much impressed with the case but for the fact that within three weeks from that time he saw a girl, from a near-by boarding school, who had been sent to him for an abscess of the ear. There was a discharge with very little pain or pus, but a continuous temperature of ninety-nine and one-half degrees every day. A paracentesis was performed. Some slides had been made from the condition, and a report of staphylococcus aureus was returned. The young woman never seemed quite ill, but at the same time the disease in the mastoid process progressed steadily. There never was very much tenderness, but the speaker never saw a time when she did not have a slight temperature, and the area of involvement seemed to increase. A radiograph was finally made, for she had been suffering about three weeks, which showed a very extensive mastoid involvement. She was operated on and granulation tissue was found throughout the entire mastoid area.

Dr. Phillips said in a very large experience in mastoid cases he did not recall many with this peculiar infection. He was tremendously impressed by the extent of the disease, and had come to think that these were cases one had better not postpone too long. The girl made a remarkably rapid recovery and never had any reaction from the operation, and about the ninth day he permitted her to leave the hospital and take a train for her home in Detroit. He wondered whether any of the gentlemen present had had much experience in cases of this type.

DISCUSSION.

Dr. Rae said he would like to ask Dr. Phillips whether the bacillus in these cases had been obtained by smear or culture.

Dr. Phillips said that a culture of both these cases had been made by Dr. Dwyer.

Dr. Dench said that he considered staphylococcus infection

very rare. He had seen a number of cases in which the predominating organism in the smear was staphylococcus, but in operating upon the mastoid the mastoid smear showed streptococcus. He believed thoroughly in Dr. Phillips' suggestion as to prompt operation upon cases of suspected mastoiditis. The opening of the mastoid was such a simple procedure, and the cases made such perfect recovery after early operation, that in a case where there was a doubt the mastoid should be opened early.

In speaking of Dr. Quinlan's case, this case illustrated how quickly recovery followed exploratory operation upon the mastoid. He cited a case coming under his own observation in which there had been a rupture of the drum membrane following a fall. Suppuration had ceased when Dr. Dench last saw the case, but in spite of this fact the mastoid was opened. A small area of suppuration was found, but a fracture of the skull was discovered at this time, the line of fracture passing vertically downward through the squamous plate and entering the mastoid. The line of fracture was explored and an extradural clot evacuated. The entire wound was sutured, excepting at the lower angle, where a small drain was inserted The man was well at the end of seven days, the wound being completely healed. The patient had Jacksonian epileptiform convulsions prior to operation. His epilepsy has disappeared after the operation.

Dr. Duel said that the study of the staphylococcus albus was very much in its infancy. At present the custom in the laboratory was to classify as staphylococcus albus all cultures of cocci which did not produce pigment or hemolysis. The virulence of these organisms was very variable, and he thought the time would come when the various strains would be differentiated in some such way as the pneumonia organism is at present. Some of them were perhaps most virulent, while others were benign. Some studies of cases of staphylococcus albus infection had recently been made by Dr. Dwyer at the Manhattan Eye, Ear and Throat Hospital Laboratory, which would excite much interest and might lead to important differentiation of these organisms of great clinical value.

Dr. Quinlan said he would like to ask Dr. Dench if it were his custom, when he had a fracture of the skull, with profuse

discharge from the ear, to irrigate. Was there not danger of carrying the infection into the cranial cavity by so doing and filling up the fissure with infective material?

DR. DENCH reiterated his belief that there was not the least possible danger of infection being carried inward by irrigation. He did, however, believe that there was a positive danger if the external auditory canal was allowed to remain full of discharge. This was particularly true in traumatic cases where there had been a fracture of the skull with rupture of the membrana tympani.

DR. QUINLAN said he would ask Dr. Dench if he used suction in these cases and then wiped dry. He said force might carry infection through the fracture into the labyrinth. It was purely a thought regarding these fractures accompanied by suppuration, as to what was the wisest provision, in these cases, whether to wipe by absorbent cotton or by irrigation.

DR. DENCH said that some method must be employed by which the majority of these patients could take care of themselves. They could not use a suction apparatus, and he believed that irrigation of the external auditory canal was the most feasible method of keeping the canal clean. He could conceive of absolutely no danger following this plan of treatment. He said that as the intracranial pressure was positive, irrigation of the ear could not possibly force microorganisms into the subdural space. He realized that at the present day the treatment of acute suppuration by irrigation was questioned. He called the attention of the Fellows, however, to the fact that this plan of treatment had withstood the test of time, and he believed it to be the most feasible means of keeping the external auditory canal sterile.

DR. MCKERNON said, in regard to the cases Dr. Phillips spoke of, that some years ago he had a case, four and one-half years of age, in which an incision was made into the drum membrane, a smear taken, and the report of staphylococcus albus made. Some four or five days later the child developed a mastoid, and after that the speaker took the culture down to Dr. Sondern. He also reported staphylococcus albus in the pus. Some eight days later the child developed sinus thrombosis. Dr. McKernon resected the vein, and the clot in the vein for about one inch below the foramen was cultured

and showed a pure streptococcus. He agreed with Dr. Duel's idea, that they would know more about this later on. Oftentimes an infection in the mastoid on culture proved more virulent than when the culture was taken from the lesion. He did not believe that staphylococcic infections, as they saw them, were at all uncommon from the standpoint of mastoid infection. Those who were present at that meeting might recall the case reported by Dr. Day, of staphylococcus infection in the mastoid, where the mastoid was involved to such an extent that it was almost beyond treatment. Dr. McKernon said he had seen several cases of pure staphylococcus, both in the smear and culture, but those cases in which the jugular was involved usually showed in the culture of the clot in the vein a distinctly pure streptococcus.

Dr. Dench said that early this year he had seen a child who apparently had had a very mild middle ear infection. About five days after the inception of the attack, and when Dr. Dench first saw the case, the patient had a temperature of 105°. The left ear showed signs of a mild acute otitis media. The left drum membrane was incised, and a smear showed cocci in groups and occasionally in pairs. A blood culture was made when the drum membrane was incised, and twenty-four hours later showed streptococcus in pure culture. The mastoid was opened, the lateral sinus opened, and the jugular excised. The patient made an uninterrupted recovery.

Dr. Dench called attention to the fact that the exact report as to the character of a smear depended very largely upon the particular laboratory to which the smear was sent. In one of the hospitals with which he was connected, the smear from the external auditory canal almost always showed staphylococcus, and it was only upon culture that the true infecting organism was determined. In another institution, where perhaps more time had been given to the study of aural infections, the laboratory report of the smear taken from the canal almost invariably showed the organism which when the case came to mastoid operation was found to be present in the mastoid secretion. For this reason Dr. Dench believed that in reports of aural smears the personal equation of the bacteriologist could not be neglected.

In closing, Dr. Dench said that in his own experience he

had seen only one case of pure staphylococcus infection of the mastoid.

DR. DUEL said he thought that an important advance was soon to be made in the differentiation of the different strains of the staphylococcus albus.

DR. PHILLIPS said that these cases made him feel a great deal more afraid of that type of infection than he had been before.

Report of Case Previously Presented.

DR. LUTZ said that the case which he had reported at the last meeting of a girl with apparent meningitic symptoms and a sterile fluid turned out to be a case of poliomyelitis. He had two such cases at the Brooklyn Eye and Ear Hospital.

CHICAGO LARYNGOLOGICAL AND OTOLOGICAL SOCIETY.

Meeting of March 20, 1917.

THE PRESIDENT, DR. STANTON A. FRIEDBERG, IN THE CHAIR.

Case of Falsetto Voice.

DR. ELMER L. KENYON presented a young man who had possessed a falsetto voice, but whose voice was now normal Dr. Kenyon said that this patient had been first presented two or three months previously, when his voice was of the falsetto type. The falsetto voice had developed when he was fourteen years old, without any special determining circumstances. There had been no essential trouble in getting back his natural voice, and with an intelligent patient there is usually no great trouble. The greatest difficulty had been that the patient had at first been unwilling to accept the new voice. He could not believe it was the kind of voice he should have. Dr. Kenyon said the present voice was not as perfect as it should be, because the patient had not been able to give sufficient time for training; when one remembers that the falsetto voice results from a psychologic misconception that develops into a fixed habit of holding the larynx high up in the throat under tension, one realizes that it may take time to overcome the habit fully. If one remembers these causal factors and knows something concerning the mechanics of the voice, he should quite readily be able to bring about correction. The speaker's habit was to explain to the patient the main facts concerning voice production, to demonstrate the unnatural high position of the larynx, point out the unnaturally high pitch and tenseness of the voice, and so lead up to the training which causes the voice to rest on chest instead of on throat action. The voice showed great improvement since the last time he was shown. Dr. Kenyon said he had hoped to bring a patient who not only had a very high pitched voice similar to this, but also a markedly tense voice, in whom the problem was much harder.

Dr. Kenyon also presented a young man who stammered.

The patient had hesitated about coming over, because he said it would be very hard for him to talk before an audience. The patient began to stammer when he was a small child, his father having also been a stammerer. He was twenty-six years of age, and had previously made six efforts to recover, and had been treated in four other large cities in the United States in an attempt to get relief. He had taken treatment at two of the best known and largest schools for stammerers, and had spent more than four months with a neurologist in New York City. He came to Chicago on December 14th and went home on the first of February under complete control He had returned for the greater security of a more fully developed technic. Dr. Kenyon said he was not "cured" (no stammerer was ever cured in three months), but he had control over his speech, which, if kept up long enough, would ultimately result in cure.

Dr. Kenyon said that stammering schools which advertised so extensively, practically all "guaranteed" a cure in six weeks, but that in fact a "cure," in the very nature of the disorder, was utterly impossible in so brief a time, unless it happened that the stammerer was just on the point of spontaneous recovery. However, it was often possible for the stammerer to gain a capability of control in a less period of time. Some of these advertisers who promise such lavishly impossible things have the written published endorsement of leading physicians. In other words, these men who get their living by deliberate deception are, in some instances, backed up by reputable physicians, who themselves are doubtless deceived. Such competition was hard to meet by ethical methods. The patient talked under perfect control, explaining that his four months of treatment under psychoanalysis had resulted in absolutely no benefit. He had stammered worse at the end than at the beginning of that treatment.

Carcinoma of the Larynx.

Dr. Joseph Beck presented a case of carcinoma of the larynx, and showed the specimen and microscopic section.

Dr. Beck said one of the interesting points about it was that the patient had been under treatment by X-rays for two years and was apparently cured by that method of treatment. The

specimen showed that it was quite a large growth and required a laryngectomy. He said it was unusual to find such a case in the anterior part of the larynx within the boundaries so it might be removed entirely before the invasion had extended to the neighboring regions, and for this reason he considered it interesting. He said the point he wished to make about the after-care was in reference to the voice as a question of an artificial larynx, and he prepared this patient for such a proposition. He had left an opening in the subhyoid region which he thought would ultimately be lined with mucous membrane and would allow the upper part of the artificial larynx to be introduced behind the tongue and the other end into the trachea. He had introduced a rubber tube in that way, and the patient could speak so that he could be understood across the length of a room, and at the same time he could breathe through it freely. He said that was the great feature about laryngectomy; the patients fear that they will be dumb, and although they are told that they will be able to make a sound with their buccal cavity, it is not that of speech. He intended to consult Dr. Kenyon about producing the artificial voice as had an artificial larynx inserted into the trachea had found sidered it too early at present, for it had only been but two months since the operation. Dr. Beck said that most cases who soon as the patient had reached the proper stage, but he conthem unsatisfactory and had thrown them away. He said someone had devised an artificial larynx in which one end fitted into the trachea and along the side of the lower jaw and side of face into the nose and back into the nasopharynx. In that way the patient got a voice. That apparatus was supposed to be the best that there was known at present. He said the tube in this case presented was not objectionable, because it was hidden. By bringing the chin against the chest the hyoid bone would compress the tube and thus prevent the food from going down into it, but rather allowed to pass into the esophagus. The possibility of his having a voice was most interesting.

Radium in Sarcoma of the Larynx.

DR. BECK also presented a case showing the results of the use of large doses of radium in sarcoma of the larynx.

He said the case offered many points of interest in the history, but he would only state that he had had two tracheotomies

in order to save his life. He had a rapidly growing tumor for which he had a thyrotomy with the burning process of Percy's method, cleaning out the whole anterior portion of the larynx. There resulted a recurrence and a great sloughing from the burn. They had followed this up with large doses of radium. Dr. Beck thought the profession was very fortunate in having in Chicago an institution where they could have the use of such large doses of radium. He had always been doubtful about the value of radium, because in such amounts as he could use it had not proved beneficial, at least not in carcinoma. The rapidity with which the sarcoma melted away in this case was simply marvelous.

Sarcoma of the Hard Palate.

DR. BECK showed some stereoscopic photographs of the case. The points of interest were the rapid disappearance of a tumor the size of a Lima bean and the occurrence of a severe burn of the tongue and palate. The amounts used were 125 mgs. for twenty-four hours in eight hour periods. In the laryngeal sarcoma the patient had 75 mgs. for thirty-six hours at twelve hour intervals.

DISCUSSION.

DR. ELMER L. KENYON thought Dr. Beck's scheme for producing the voice was very ingenious and likely to bring about excellent results. He said he would be very glad indeed to watch it. He thought it was true that patients with carcinoma who had had a laryngectomy and had used a laryngeal tube of the old type soon discontinued its use, but that a certain amount of them, with patience and perseverance, could develop a voice of low carrying power, and some of them occasionally were able to develop a comparatively large voice. He saw no reason why Dr. Beck's scheme was not a very good one indeed.

Hemorrhagic Mastoiditis.*

BY GEORGE W. BOOT, M. D.

DISCUSSION.

DR. JOSEPH C. BECK said the case of his that Dr. Boot reported gave none of the classical symptoms or indications for

*See page 744.

a mastoid operation except the fact of the brain symptoms, which made him decide to operate even as late as he did. He thought that Dr. H. W. Loeb had reported two cases instead of one, and referred to this other one; his bacteriologic examination disclosed the diplococcus. He also called attention to a possible connection between that and pneumococcus. Dr. Beck did not know that a bacteriologic examination had been made and a definite result obtained in his case, but remembered they had made cultures at the time of the opening of the mastoid. He thought the most interesting thing was the X-ray pictures, and said that the mastoid cells in this case showed them to be clear, and he thought that the light over the mastoid probably would not transilluminate the mastoid process. That made the X-rays of more value than the transillumination, as they were not obstructed by the blood clots. He said he had worked a little further on this case—namely, on the pathology of the mastoid bone. He said he had sectioned this bone and was going to give Dr. Boot the result of his histologic examination. Grunnert was one of the first to bring out the subject of phlebitic osteitis of the mastoid cells, and called attention to the fact that in those cases sinus thrombosis was common, either by way of the emissary vein or through the inner plate directly to the sinus. This case of his was not of that type. This was not an osteophlebitis septica of the mastoid, because the bone was not affected. The pathology was a great deal like the mastoid in which the cells are filled up with material which pulsates and bleeds very easily. He thought the work that had been done on the confluent mastoiditis would be remembered, where all the partitions were destroyed by the pressure of that material. Dr. Beck thought it was very interesting to study the pathology of mastoid disease after operation, the same as the study of X-ray pictures after operation; he stated that he liked to study the X-ray pictures after operation because one often saw things then that they did not see before, and could use it in subsequent cases.

Dr. J. Holinger cited his observation of a lady, sixty-four years of age, who was very delicate and became sick suddenly one Saturday afternoon. The house physician made what he called a paracentesis, but the patient grew worse. She had

some fever, which was to be expected in a person of that age. Dr. Holinger saw her on Monday morning. She had suffered severely all day Sunday and Sunday night. Had received a hypodermic of a quarter of a grain of morphin at four o'clock in the morning and an eighth at seven o'clock. When he saw her at eight o'clock she was in severe pain. There was some discharge from the ear and a few blood clots which he could not remove. The morphin had practically no effect, although she had received three-eighths of a grain, which was certainly a considerable dose, especially, as became evident later on, as she was very susceptible to narcotics. She had vomited and there was definite spontaneous nystagmus. Dr. Holinger made a diagnosis of beginning invasion of the labyrinth. He said two members of the society saw her, and promptly denied the presence of meningitis. According to postmortem statistics, the diagnosis of meningitis is made by far too seldom. Therefore, in spite of the absence of a Kernig, he insisted upon an operation on account of the symptoms of irritation of the labyrinth. At the operation, two days later, the cells which were distant from the antrum were clear, the antrum and middle ear were full of tightly adherent blood clots similar to those Dr. Boot described. The patient felt greatly relieved after the operation and made a good recovery.

Dr. Holinger asked whether there were any other patients of this kind showing symptoms of irritation of the labyrinth in connection with hemorrhagic mastoiditis.

Dr. A. S. Rochester said that within the last few hours he had operated on a case which, while he did not believe it was a pure hemorrhagic mastoiditis, still it presented some features which made it of interest in connection with this paper. The patient had had a cold in the head four days previously, used a nasal douche, and within a few hours developed an acute pain in both ears. The drum membranes were found to be bulging, and a paracentesis was done on both sides; on the left there was a very bloody serous discharge, and on the right side a slightly bloody discharge, the blood soon clearing up. The left continued to be bloody constantly, but the right showed very little blood. He had today become convinced that both mastoids should be opened, and so had opened them both this afternoon. The left mastoid, which had the bloody

discharge, during the operation bled profusely, the cells were broken down and filled with very bloody granulations and pus. On the right side there was very little bleeding during the operation, the cells were broken down and filled with yellowish pus but very little blood. He thought it was interesting, because from the start the one side was so bloody and the other was not.

DR. CHARLES H. LONG thought a number of such cases would be found if they were looked for more carefully. He said that in working in the laboratory he had found two or three cases, but knew nothing about the history.

DR. JOSEPH C. BECK, in answer to Dr. Long, said that Wingrave had shown postmortem changes in the sinus as well as in the mastoids, the same as Dr. Long had found.

DR. BOOT, in closing, disagreed with Dr. Beck about what Dr. Loeb reported; he said Loeb distinctly called the organism a diplostreptococcus. He thought there was a close relation between these cases and pneumonia, and the fact that the exudate in the cells was a fibrinous affair, not serous, and the fact that there was very little bleeding was interesting. He thought it was a distinct type of mastoid, and not very common.

Hemorrhage in Rhinolaryngologic Work.*

BY ARTHUR M. CORWIN, M. D.

DISCUSSION.

DR. J. HOLINGER thought there should be a differentiation between hemophilia and simple bleeders. He thought that hemophilia was a well characterized disease, and appeared to be well known to the people themselves, and that it existed here. He stated that he knew a family with two sons who both died from hemorrhage—one from a simple little pinch of the finger between the doors. The finger bled and bled and could not be stopped. He thought people were often careless about telling the physician that there was a hemophilic tendency in the family, and in one such case a physician removed the tonsils. The hemorrhage was not very strong in the beginning, but twenty minutes afterwards there was a distinct gush, and

*See page 749.

within five minutes the boy was dead. He said Dr. Corwin had stated that there were few grown male hemophiliacs, and drew from that the conclusion that the abnormality was overcome later on; but that was a mistake, for the reason was that they died young from slight injuries. He said the doctor who lost a tonsil case was Dr. Banga, and he had worked on the very problem in Europe and was the first to bring out the peculiar feature of heredity, that daughters of hemophiliac fathers would have hemophiliac sons, while they themselves were not hemophiliac.

The speaker was sorry that Dr. Corwin did not follow up the literature on coagulin, and stated that in Prof. Kocher's clinic in Berne an assistant, by name of Fonio, had for years followed up these cases of slow coagulation, especially the cases of hemophilia, and found the cases of hemophilia had a lessened number of blood platelets. The platelets were not entirely absent, but were much more rare than in the normal blood. Fonio gave as an explanation of hemophilia a congenital scarcity of blood platelets. Dr. Holinger said he had shown the coagulin (Fonio) in this society. It consisted of the blood platelets isolated from the blood and treated in such a way that they did not deteriorate, and their effect on a bleeding surface was identically the same as the effect of the blood platelets in the blood. The blood platelets deteriorate very readily as soon as the blood is exposed to the air. This sets free a ferment which causes the fibrin to coagulate. Fonio succeeded in stopping hemorrhage in hemophiliacs by means of coagulin.

Dr. George W. Boot said that in cases of hemorrhage with a high blood pressure, he thought it was a good plan to give the patient a hypodermic injection of nitroglycerin to lower the blood pressure. He also believed that hemophilia occurred in this country. In one case at Cook County Hospital a year or so ago, where a tonsillectomy was done, they tried for two days to stop the bleeding, trying horse serum, transfusion of blood from one of the parents, and everything else. He said the test of the blood for coagulation was very simple, they only needed a wire with several little loops in it. The successive loops containing blood could be dipped into water at half minute intervals until at the end of five minutes it was possible to tell whether the blood would coagulate promptly or not.

Dr. Charles M. Robertson thought that socalled hemophilia in most instances was transitory. He believed the so-called hemophiliac was one in which the condition of the blood was the result of some infection, and changed with conditions of the patient at different times; a patient that was hemophilic today might not be hemophilic a week or a month from now. He thought the cases which were bleeders from birth might inherit this habit, but that even those might be cases which were infecetd in utero, in which case they may overcome the condition. He said that Dr. Lespinasse had operated on fifty cases under one year of age, and some as low as four days, by means of a transfusion by the direct methods, and this had stopped all of these bleeding cases and saved the children. He said he had noticed in many cases in operating upon the nose that there were certain ones in which the action of adrenalin was peculiar; the patient would be treated with applications of adrenalin with absolutely no effect at one time, and at a later period the effect would be good. That, to his mind, was an indication that the patient in the first instance was in the throes of an infection, and when his condition was improved the coagulability of the blood assumed a normal condition. He thought they should be careful in stating that there were many hemophiliacs; there was no doubt that there were a few who were true hemophiliacs, but even in these cases they must eliminate the condition of the blood which might be produced by a chronic infection, and we know that nearly all cases which come to us have infection, in the alveolar process, the tonsillar region or in the gastrointestinal tract, so in dealing with hemophilia it had been his custom to treat it as a symptom rather than a real condition.

Dr. Harry Kahn thought that the time of coagulation, seven, three, or ten minutes, depended upon the method, and that each method must be standardized. He said there were many methods, but the simplest was to take the watch, puncture the lobe of the ear, put a drop on the watch crystal and then with a rounded needle, wait until you could draw out a thread of fibrin, time the procedure on the watch; this usually occurred in three minutes. He advised the use of a round needle rather than a cutting needle, so as not to cut up the blood platelets or corpuscles. He thought no matter what

method was used, it should be standardized and the same methods used in all cases; probably none of them showed the real coagulation of the blood, but in long coagulation time, eight to ten minutes, he had had no bad effects from operation. The hemorrhage had stopped just as promptly as in shorter periods. Cases in which longer time was required for the coagulation should not be operated, but be treated and held until the coagulation time was reduced to normal limits.

Dr. Harold I. Lillie said that the research laboratories of Leland Stanford had produced very interesting work on the blood. They had shown that calcium lactate, if administered preoperatively, in a good many cases is ineffective except in one condition, and that was chronic jaundice, in which the calcium was firmly bound when it did increase the coagulability of the blood. They further say that the five, ten or fifteen minutes as a normal time for the coagulation of the blood to take place could not be named definitely, because, as Kahn suggests, the methods differ and have not been standardized, and unless the coagulation could not take place up to an hour, it might be said to be within normal limits. He said they had also shown by animal and patient experimentation that the sera on the market if more than a month old was ineffective. It must be fresh. Human serum is very much more efficient. The whole blood can be administered subcutaneously or intravenously much quicker than to wait for the serum. In a report from Budapest, where thirty-five cases of spontaneous hemorrhage in children occurred without any definite clinical sign, cultures from the nose showed pure cultures of diphtheritic bacilli. These cases cleared up promptly with massive doses of antitoxin. The speaker said he had one such case this year where the hemoglobin was f- five per cent, the patient had been bleeding at the nose two days, and appeared extremely ill, and when the pack was removed he continued to bleed. There was no clinical evidence of any diphtheria—a little thin discharge, which no one could suspect as diphtheria. Culture from the nose showed diphtheria bacilli. The patient was given 30,000 units of antitoxin; in three days' time a double otitis media developed. Incision of the ear produced a very thin pus which was also shown to contain the typical diphtheria bacillus. This cleared up within four days.

He said this case occurred in private practice, and the only symptom was nose bleed.

DR. JOSEPH C. BECK thought the discussion would be profitable, particularly from the point of nomenclature, for the loose way of applying the term hemophilia. Some of the men stated tonight that they had seen cases of hemophilia in this country. He had been carefully watching for a clear case, from the point of the history, of hemophilia, but thus far never encountered one. He believed one important point when they were to operate on a case was the history of that particular condition. He was sure the question of bleeding was frequently overlooked, and the history of bleeding should be gone into more carefully. He thought men did not often ask if there was profuse bleeding in the family following extraction of the teeth or other minor things.

He said Dr. Corwin had stated that adrenalin was often ineffectual on account of raising the blood pressure rather than decreasing it, but there were types of hemorrhage in which adrenalin was a specific, especially in cases of hemorrhage of the eyes, nasal and skin bleeding of the newborn. He had seen two cases in the newborn in which nose bleeding and mouth bleeding was present, where the use of fifteen minims of adrenalin was repeated every two hours and the bleeding stopped, and the child had remained well now for three years. Dr. Beck was sure the adrenalin must have an effect, probably from its compensatory action, and he thought this point should be made in exception to the statement that it was ineffectual.

The speaker thought Dr. Corwin had brought out very forcibly the fact that the term "hemophilia" is used loosely. He thought it was often applied in place of cholemia, and said that excessive bile in the blood would retard the coagulation greatly, and the same was true in septic conditions.

The speaker thought that in cases where the question of diphtheria arose, that when the diphtheria bacillus was found and the antitoxin used, one had a right to believe that it was the antitoxin that stopped the bleeding, but he believed the serum in the antitoxin was also of value in stopping the bleeding. He said one of the first cases on which he used serums for bleeding was a case which had been bleeding for five days after a nasal operation; the temperature was 106° F., the pa-

tient had received salt solution under the skin, and a double infection resulted, one due to the bacillus aerogenous had developed. The hemoglobin was very greatly reduced and the blood pressure was low. In this case he had stopped the hemorrhage by a large dose of antidiphtheritic serum. He believed it was a question whether in these cases the bleeding was not stopped by the serum rather than the antitoxin. He also cited the case of a lady who had a postpartum hemorrhage following the third child birth, the first two children having produced no trouble. In the time between the birth of the second child and the third one she had an operation for necrosing pancreatitis, and following this she had several attacks of rectal bleeding which were diagnosed as internal piles. Following this third delivery she had, as stated before, a postpartum hemorrhage, and was a long time recovering from the effect of the bleeding. Three months later he was called to see her on account of a nose bleed which had been very profuse. There was no evidence of a bleeding point in the nose, but on the body, around the knees and some other places, there was evidence of small hemorrhages (Shoenlein's disease). Dr. Herrick saw the case in consultation, and concurred in that diagnosis. Dr. Beck said this patient lived for a year with hemorrhages which were best controlled with placental blood locally applied; if fresh blood is locally applied it will often cause a hasty coagulation. Professor Hiss, who was in this country at that time and saw the patient in consultation, advised her going to Europe to be treated, and the family sent her there. There she received injections of large doses of radium solution, and following the injection of these radium solutions, which were gigantic, the bleeding stopped almost instantly, no matter from where it occurred. Nevertheless, she died from this prolonged bleeding, which was diagnosed as purpura hemorrhagica.

The speaker said that two of the children during the last year developed attacks of acute otitis media. They were suffering from tonsil and adenoid most profoundly. The family doctor insisted that as soon as they recovered from the ear trouble the tonsils and adenoids be removed, but Dr. Beck refused because of the history of the mother. But later on they took up the question again, because he felt it was only

fair to the children that those tonsils and adenoids should be removed. They found that one child gave a coagulation time of seventeen minutes and one thirteen minutes, consequently they put them on calcium salts, and inside of a month they determined, by the Sahlie method, the clotting time to be seven and six minutes respectively. They decided then to operate under nitrous oxid and ether anesthesia with a very little accessory ether. The tonsils and adenoids were removed without much bleeding, but he sewed in gauze sponges in each tonsil cavity and there occurred no bleeding. When the tampons were removed there was also no bleeding, and none after that. Dr. Beck did not know whether the calcium had the effect or the tamponage, or whether the children would not have bled anyway, but it was an interesting fact. The internists believe that the removal of the tonsils from these children will have a tendency to protect them against the development of such a condition as occurred in the mother.

DR. CORWIN, in closing, said that Dr. Holinger evidently must have misunderstood him in referring to the fact that there were few adult hemophiliacs. He knew that it was true that there were few of them, but it was perfectly possible for a true hemophiliac to outgrow the proposition if they were kept alive long enough. He thought very little was understood about this condition; the blood picture was largely normal, but the blood clotting is markedly below normal, and the blood platelets, according to many authorities, are not reduced as they are in purpuric conditions. Why bleed? Faulty clotting. Why faulty clotting? Nobody knows. So far as the platelets are concerned, the speaker thought it had not been proven that their lack counted at all. He considered the coagulum good as far as horse serum was good, but not so good as coagulose which was made of human blood.

He said Dr. Boot brought out some good points, but while nitroglycerin might be used to lower the blood pressure, pituitrin would do the same thing, as he had noted in the case of three adults who had extremely severe bleeding and where pituitrin had lowered the blood pressure, though commonly supposed to raise it.

He thought that when Dr. Robertson said that hemophilia was sometimes hereditary, he was wide of the mark, for it

was always hereditary—more so than any other disease known; the doctor had also said it was transitory, and if he meant by that that it usually kills people quickly, he was right about it, but if they su[illegible]y the use of horse serum or what not, they migh[illegible]d live to adult years.

He thought [illegible] brought out by Dr. Lillie and Dr. Beck were excell[illegible]ones, and he believed the history of heredity and the personal history of the patient should always be considered, as a single violent bleeding is not to be taken as a hemophilia, under any circumstances, without other considerations, and one of those was the history of female transmission only to males. He said there were no female hemophiliacs. In the case of the lady with the pancreatitis with a developed hemophilia, he thought that brought out the ve[illegible] he wished to make definite in the paper, and that wa[illegible]t there is a great grouping of purpuras—many varieties included in a symptom complex—without any such definite pathologic background. The superficial hemorrhagic spots and the deep seated, the simple purpura and the purpura hemorrhagica, are only different in degree, and all mean toxic conditions with a leakage through the vessels because the vessels themselves are deteriorated, and also blood lysis, as is not the case in true hemophilia. In hemophilia there is neither blood deterioration which we can prove nor vessel deterioration, but in the children and in the case of the lady there was a blood lysis and vessel deterioration.

Dr. Corwin said the point of the paper was to bring out the sharp distinction as between a proposition which was always hereditary and one with practically normal blood picture but greatly delayed coagulation, and all the other purpuric conglomerate forms of hemorrhage which are present today and absent tomorrow, and which have no place in the classification of hemophilia.

CHICAGO LARYNGOLOGICAL AND OTOLOGICAL SOCIETY.

Meeting of April 17, 1917.

THE PRESIDENT, DR. STANTON A. FRIEDBERG, IN THE CHAIR.

Perforation of the Septum.

DR. JOSEPH C. BECK presented a patient who had a perforation of the septum as large as the end of the thumb, the etiologic factor of which was not proven. There was no evidence of its being syphilitic, but it had troubled her greatly because of ulceration of the edges. Dr. Ballenger had attempted to heal it by transplantation of cartilage, but without success. Dr. Beck had subsequently made several attempts, one by transplanting the middle turbinate body into the space, but without results. He had afterward succeeded very well in closing the perforation, bringing forward the ends of the inferior turbinate body, the posterior end on one and the anterior end on the other. At the time of exhibition the left anterior body passed through the anterior part of the perforation into the right nostril and sutured to the edge of the margin of the perforation. All that remained to be done now was to cut the pedicle half off the posterior end of this turbinate before placing it with the margins of the perforation. The patient was presented to demonstrate that large perforations may be closed. This was the first one of this size that Dr. Beck had succeeded in closing. He had also used the inferior turbinate body in a similar way in closing a cleft in the hard palate which would have been very difficult to close otherwise. He found that the inferior turbinate body would heal in beautifully if its edges were made raw. He expected to finish the operation on this patient and then show the end results. The transplant acted as an obstructing agent at present, but this would not be the case later when it was trimmed down to the desired size and form. The question has often been asked of Dr. Beck, why go to all that trouble in order to close a

large perforation that was not causing any more trouble than a slight crusting? He wished to state that the main reason was because the patient objected to the question "Have you ever had syphilis?" every time she had a nasal examination by a different man.

Subperiosteal Abscess of the Mastoid: Cure by Paracentesis.*

SAMUEL SALINGER, M. D.

DISCUSSION.

DR. OTTO J. STEIN said it had always seemed remarkable to him that we did not see more such cases as Dr. Salinger described. Probably a good many are seen without being recognized. He had observed a similar case a good many years ago which led him to think that the abscess originated through the squamous mastoid, which is recognized as the most common avenue through which pus can reach the surface of the cortex aside from perforating through the bone. In this case he discovered that the abscess had developed by dissection along the roof of the auditory canal. He saw another case a few years later, and therefore this route should be taken into consideration as an avenue along which pus may reach the surface of the cortex by dissection along the canal wall, its entrance being through a defect in the tympanic ring or via the Rivinian notch, and in that way produce all the manifestations of a perforation through the cortex. In such cases where the drum has not ruptured it is very feasible that resolution may result without operation on the mastoid.

DR. JOSEPH C. BECK thought that a thesis usually presented all the facts a man could gather, especially on such an important matter as this, and the fact that the essayist's case got well would be good evidence that that was good treatment. Mention was made in the paper of statistics by men like Hakaza Kanasugi, who has done many more operations than was mentioned. Kanasugi is an expert anatomist on the mastoid, he has supplemented his studies with X-rays of the skull and has found many of these of great interest. The essayist in his paper said nothing in reference to making a

*See page 758.

diagnosis by X-ray. Another statement was made, namely, that there are no mastoid cells until a certain time in life. This is constantly mentioned in older papers in the literature, but it is not borne out by operations on infants, many of whom have large mastoid cells. The roentgen diagnosis of the mastoid proper in cases like this which the doctor reports is very important. Just because these two cases recovered without operation at this time is a question whether it is as well as if an incision had been made and the antrum opened up. It is an unnatural drain of the deep parts of the opened mastoid and cannot drain well through the antrum and into the middle ear. In such cases as the doctor described if it is only a passage of the pus through the sutures the X-ray would show it.

Dr. Beck had also noticed the absence of names of two great workers along this line, one Luck and the other Kerrison. He asked for Dr. Salinger's opinion of these two papers.

DR. SALINGER, closing, said the point made by Dr. Stein was very well taken. The pus may reach the cortex by means of the auditory canal, but according to Mygind there are symptoms along the canal which would point to that; however, in his own cases those symptoms were not present.

Regarding the pneumatization of the mastoid, Dr. Beck misunderstood him. He said that according to the authors who studied it, pneumatization was not complete until the age of puberty, but that did not mean that there were not mastoid cells before that age. As to the X-rays, he was very unfortunate; one case was treated at home and the other was shipped out of the hospital before he had an opportunity to do much with it; the X-ray would undoubtedly have shown the existence of the sutures.

Report of a Case of Nasal Sarcoma Cured by Radium.*

OTTO J. STEIN, M. D.

DISCUSSION.

DR. ALBERT WOELFEL said that however one might evaluate this report as evidence of a case of sarcoma cured by radium,

*See page 782.

it was at least a very good example of what is known by radium users, namely, the peculiar susceptibility to the action of radium of sarcomas of the upper respiratory passage. It is thought that round celled sarcoma generally responds to radium treatment more readily than other forms, but it is also an observation of radium users that tumors that are nominally of the same type show a different response to radium treatment in different parts of the system. This case is more than a good example of the ready response to radium of this kind of a tumor in the upper respiratory passage, however, it is one of the best to illustrate this point that we know of. When he recalled the difficulties in the application of radium and other circumstances in this case, he was much surprised when Dr. Stein reported the end result.

Another thing the case illustrated was the efficiency of distance irradiations. Physicans often say they know that if you can apply radium directly to malignancies you can effect something, but for distance irradiation it is no use. But in this case we certainly have an illustration of what distance irradiation can do. In this patient where there was bulging and fixation in the abducted position of the eyeball, due to invasion of the socket, there is no doubt that the mobility of the eye which followed the irradiation around the orbit in three or four weeks was effected by the radium.

Another point the paper and his experience with Dr. Stein on this case illustrates is the mistaken idea that seems to prevail that large doses of radium are necessary to effect such changes in sarcomata. Under the influence of the reports of Kelly, who describes irradiations with enormous doses of radium, a physician said to Dr. Woelfel recently: "I don't believe you fellows know anything about radium," because we prescribe such relatively small doses. We have been puzzled by the reports of Kelly regarding the use of such large amounts of radium, and the only way we can account for it is that he must be using the emanation from these large amounts of radium, which emanation would have quite a different radiating power, unless it is drawn off when the radium is in equilibrium. If such large amounts of radium were applied for any time at close range they would have a burning effect that would hardly be beneficial.

The final point was that in using radium we should not be so impatient of results. Dr. Stein told how, before we thought we were through with the patient, further radium treatment had been prescribed. It was not believed that the irradiation that had been employed had had so much effect. It takes time for the effect to develop, a fact that is being learned more and more. Probably therefore the best general technic to adopt is to begin a series of irradiations, get the gross effect and then wait for some weeks to finally get after the treatment to effect the end result.

DR. JOSEPH C. BECK said he had two cases of sarcoma which had been treated by Dr. Woelfel by those large doses of radium. One was sarcoma of the hard palate, the other of the larynx. The tumor of the hard palate was the size of a bean, flattened on the surface of the hard palate. He excised a piece for microscopic examination and found same to be a sarcoma. This patient received one hundred and twenty-five milligrams for twenty-four hours in three different treatments, and following that went home. He returned in less than two weeks, when the tumor had entirely disappeared, but he presented a very severe burn of the tongue and of the soft palate, from the action of the radium. This burn was very painful (presented pictures showing burned area). He thought this accident should be mentioned. The doctor used a screen of a rubber material which contained some metal, which was a mistake and would not happen again. The patient is apparently cured of the sarcoma, two months having elapsed since the treatment.

The other case was the sarcoma of the larynx which was presented at the last meeting; the sarcoma simply melted away. There were very few sarcoma cells in a recent section and very little remains of the tumor. He was to have more radium treatment and he hoped he would be cured of the sarcoma, which had been removed twice by external and internal operations and had also been burned by the Percy cautery, which he wished he had never used in any case.

Another case, a congenital lymphangioma in a little girl, had grown considerably recently. Microscopic section had verified the diagnosis of lymphangioma. The little girl had seventy-five milligrams of radium on April 16th and one hundred milli-

grams on the 17th, and he hoped they would have the desired effect. He showed photographs of the case.

As to large and small doses of radium he showed a photograph of another case of angioma on the upper lid and which spread in six weeks to a great extent. He had used CO_2 snow in the forehead, injected the main mass on the cheek with boiling water and used ten milligrams of radium pure over the eyelid. The snow removed the angioma but left an ugly scar and so did the hot water injection treatment, but the end results from radium were very satisfactory.

Another case he showed was a papilloma which involved the entire interior of the larynx and which he removed under suspension. The patient now has a mass of papillary excrescences around the tracheal opening. He intended to use radium in this case, for it has been shown that good results are obtained in the cases.

It must not be forgotten that sarcoma is greatly influenced by the X-ray also. Deep penetration treatment by X-ray will have almost as good an effect as the radium in many cases. Arsenic should not be neglected as a method of treatment of sarcomas, used in the form of salvarsan or cacodylate of soda.

Dr. Robert Sonnenschein said that some years ago he had an opportunity while working in Koenigsberg of reporting the longest standing case of sarcoma of the nose on record. The patient lived for eleven years after the diagnosis was made. It has been shown that sarcoma of the nose is particularly benign as compared with tumors elsewhere. He did not know whether that had a bearing on the cases mentioned here in regard to the efficiency of the radium and X-rays, but it may be that the character of the tumor in this location is such that it is more amenable to treatment than elsewhere.

Dr. Charles H. Long said the radium treatment in these cases was the one to discuss, but in a case he wished to mention the important thing was the diagnosis of the tumor. About the year 1910 a small boy came to Mercy Hospital for removal of adenoids. These were removed and the boy left for home, but returned with hemorrhages in the throat. Dr. Zeit examined the specimen and pronounced it sarcoma. The patient was brought to Dr. Long and they had a special tube made to use X-rays. He thought there were only three treatments,

and at each treatment a severe hemorrhage took place and severe pain in the head, so the mother refused a continuation of the treatment. The parents expected that the child would die, but he kept in touch with the case until 1911, when he was hurriedly called to the house, as the boy was supposedly dying of suffocation, but the patient had all the symptoms Dr. Stein spoke of—the bulging of the eye and cheek, the lowering of the hard and soft palate, etc., a long narrow piece of dark colored flesh lying parallel with the tongue was observed which seemed to have an attachment in the throat. This was pinched to see if it was dead, but found that it was very sensitive and movable, only twisted on its pedicle and had become strangulated. He sent the child to the hospital and had another examination made, and the report was fibroma, while the previous report had been round celled sarcoma. In looking up the literature he had found it was difficult to make a positive diagnosis between these two conditions in their early stages of development. In 1911 they removed the tumor, which was larger than a goose egg and had many tentacles besides the one in the mouth. It could not be removed through the nose, so they removed it through the mouth by incising the soft and hard palate, encircling the pedicle of the growth with a wire snare, then resecting the roots which were widely attached. The child made a good recovery.

Dr. C. W. Hanford was interested in the case, as he had seen the patient and given a few applications of radium in the early days of the treatment. He thought well to start with one hundred milligrams and quickly diminish it to about forty milligrams, and he believed it could be decreased even more than that. He preferred not to see carcinomas of the tonsils and base of the tongue, for he thought no amount of radium, small or large, would do any good, except to add possibly a few months to their life and make their existence somewhat more agreeable. In cauliflower growths on the soft palate it sometimes requires great ingenuity to have something to hold the radium in contact, so he sent the patient to the dentist to have an appliance made. It happened in two cases that the upper teeth were out of the way and a plate was made to fit the gum, and in the back portion he vulcanized a strip of wire in the rubber, which could be twisted around the tube so it

could be put directly against the growths. By this procedure these growths melt away very rapidly.

DR. STEIN, in closing, said he had been interested in radium for some time in the socalled inoperable cases, but had always received a great deal of discouragement from those who had used it, and he had used it in this case with a great deal of misgiving—first, because of the discouraging reports, and, second, because it was almost impossible up to this time to get a sufficient amount of radium. He had decided that radium to be of any value would have to be used in large quantities properly applied. He realized the very well known fact that sarcomatous growths in the nose sometimes disappear spontaneously, but nobody had ever offered any explanation for it. There is possibly still room for doubt as to the value of radium, but since the growth in this case had disappeared under the application of radium, and they were fortunate enough to be able to prove its disappearance by the postmortem findings, he felt justified in thinking that the radium had produced the change.

He had been rather surprised to hear Dr. Beck speak so favorably of radium, as he had discouraged him greatly in the past. When he asked Dr. Beck about using radium in this case he had said he thought it would be of no value; that while the patient might be benefited there would be a recurrence and not a cure. Perhaps the doctor's change of opinion had been brought about by the use of larger amounts of radium—he had always said that the radium he had at hand was probably not of sufficient amount, and it might not have been applied properly either. He would hesitate to take the improvement of any of the cases Dr. Beck reported this evening very seriously, as they were evidently very recent cases. He thought a longer period of time should elapse before such cases were reported, and something more than merely improvement in the condition. The improvement is interesting, but we want something definite—whether there is any real value and by what means.

The question as to the amount of radium to use is a very important one, and it is only recently that we have had access to such large amounts.

The point brought up by Dr. Hanford he considered very

interesting. He had read some reports in a French medical journal on the treatment by radium of sarcoma of the nose and mouth by the means just spoken of, and he thought radium could be applied in that way in a more intelligent manner. Many surgeons working around the mouth have devised some really wonderful appliances by which the radium could be applied directly to the growths. There is much to learn about radium, and a case of this kind is highly instructive.

DR. JOSEPH C. BECK, replying to Dr. Stein, said the reason he (Dr. Stein) was able to make such a definite report in his case was by reason of the untimely death; had that not occurred he could not have made such a complete report. He thought the criticism offered of his report was not well taken. The report was not made as final, but he thought in such cases it was well to make a report from time to time. The case of palatal tumor had not returned after a lapse of two months, but may still recur. He always made the report as the basis of his experiments. Ten years ago he reported on his negative results with what he thought was radium, at least he bought it for radium, but it was not pure. He had subsequently used ten milligrams of pure radium, which was as much as he could afford to have in his possession at that time. Neither of these amounts was sufficient in such desperate cases as cancer. Since we had been fortunate enough to have access to these large amounts, he had gone to work again and was reporting this present result. Under no circumstances did he wish, by his reports, to discourage any one from experimenting, but he believed in being very critical in the use of these new methods of treatment, since truth will out.

CHICAGO LARYNGOLOGICAL AND OTOLOGICAL SOCIETY.

Meeting of May 22, 1917.

THE PRESIDENT, DR. STANTON A. FRIEDBERG, IN THE CHAIR.

Papilloma of the Larynx.

DR. H. L. POLLOCK presented a little boy aged six years who had been referred to Dr. Joseph C. Beck with a diagnosis of a papilloma of the larynx. When he was one year of age he became hoarse and gradually became worse until he was three. He was then taken to a physician, who did a laryngotomy and removed a growth from the larynx, the nature of which was not known. Two weeks later he was taken back on account of difficulty in breathing and a second laryngotomy was performed. At this time there was so much difficulty in breathing that a tracheotomy was also done and a tube inserted. The boy had worn the tube until he was brought to them a few weeks previously, and it had been in his throat for a year without removal. (Exhibited photographs of patient with tube in position.) They (Drs. Beck and Pollock) removed part of the external papilloma and curetted the entire larynx. Two weeks later the balance of the papilloma was removed.

The tracheotomy tube was left out and the patient observed; as the breathing was perfect, the tube was not replaced.

The doctors intended to do a plastic operation to close this tracheotomy wound. The patient's condition was very good and he was able to use his voice slightly.

(Note: A plastic operation has since been done, closing the external tracheal opening, which healed promptly. The child was kept under observation for several weeks, and as breathing was perfect and voice returning he was allowed to return home.)

DISCUSSION.

DR. A. H. ANDREWS said it was quite usual for papilloma in these young children to return. He thought it would be

exceedingly fortunate if the tumor did not recur before the child was grown.

DR. JOSEPH C. BECK thought there was a great difference in the removal of a papilloma in former days by the indirect method and the method of suspension by which this work was done. This was not a simple papilloma; the histologic examination showed a great deal of granulation tissue.

DR. POLLOCK, closing, said that over two years ago they had a similar case from the same city in which the same operation was performed. They removed the growth by means of the suspension method and the voice was much better. It had been two years since the papilloma had been removed and there had been no recurrence in that case.

Foreign Bodies in the Esophagus: An Analysis of Fifty Cases.*

STANTON A. FRIEDBERG, M. D

DISCUSSION.

DR. ROBERT CLYDE LYNCH, New Orleans, stated that his experience in extracting foreign bodies from the esophagus had been similar to that of Dr. Friedberg in all instances. About three weeks ago he had had the unique experience of seeing into the mediastinum through the esophagus of a child three and one-half years old, who had swallowed lye, which had produced a perforation of the esophagus. Through the perforation he was able to recover from the mediastinum a pint of fluid, water, etc. The child lived for about six hours and died from the infection of the mediastinum.

He believed that in about five per cent of the cases he had seen with foreign bodies in the esophagus the smooth ones would go through; rough, sharp edged bodies stop behind the cricoid, while meat balls land at the cardiac end of the esophagus. He cited the case of a physician who would not wear false teeth who was called into the country to see a patient and was given the privilege of eating some Louisiana chicken (which did not grow nice and tender as they do up here). The doctor ate a leg and second joint of the chicken,

*See page 768.

and not being able to grind the shreds into small bits, a ball of undigested chicken was arrested at the cardiac end of the esophagus and it took an hour or more to pick out those threads. Crab shells very often lodge in the esophagus, and they have the peculiarity of producing no obstruction to the swallowing of either fluids or solids. In five cases none had had any difficulty, and in each instance he had recovered the shell, but in many cases it was necessary to split the shell and break it into fragments before it could be removed so as not to traumatize the parts. In some of the cases the suspension apparatus had served them very well. By creating a breathway with a rubber tube (not a catheter, but an open end rubber tube), passed into the trachea between the vocal cords and then practically suspending the esophagus and lifting it up, it will give an opportunity to work further down in the esophagus with both hands and in that way use two pairs of forceps, which facilitates the removal of impacted foreign bodies. Occasionally there will be little fragments that will have to be picked out. One patient swallowed a pin and the head became buried in the cartilage at the base of the epiglottis with the point sticking into the esophagus through the mucous membrane over the arytenoid cartilage so that it was brought tight in such a manner that he could not swallow or move his neck, and did not have water or food for a period of about thirty-six hours. With an esophagoscope they looked down and the first time went by the foreign body, but then he suspended him and there was the pin beautifully displayed, pinning the posterior portion of the larynx to the esophagus very nicely and it was removed without any trouble.

The speaker thought the symptoms of the presence of foreign bodies in the esophagus were very misleading to a man who had no experience with these ses, for many of them give no obstruction to swallowing, simply producing an increase of secretion of the mucous membrane of the upper portion of the esophagus and a slight irritation from this which overflows from the esophagus into the larynx and worries the patients because they have to cough to get rid of it. Most of the patients have the feeling that something is wrong without any definite symptoms at all. He believed that where there was any history of swallowing a foreign body, that was suf-

ficient to demand an examination of the esophagus for its presence or absence.

DR. NORVAL H. PIERCE said he had a great sense of comfort in knowing that Dr. Friedberg was living in Chicago, where he could be called upon at any time for his special skill. He had seen him work and knew his work was as good as anyone's in the country.

The last case Dr. Pierce had been called upon to examine was one at St. Luke's Hospital, a Belgian refugee, who was employed as a governess in Chicago and came with the history of having got a foreign body in the throat during a meal composed largely of Illinois chicken. She complained of great pain. She was rather a neurotic type and had undergone a great deal of suffering in her native country. There was nothing to indicate anything in the esophagus except the pain on swallowing; no excess salivary secretion, etc. He saw her in the office late in the afternoon, sent her to St. Luke's and saw her there in the evening after X-rays had been taken. The pain was in the region back of the cricoid cartilage, but nothing showed in the radiograph. There was a shadow, but the X-ray man was not positive whether it was a foreign body or the cartilage of the larynx. He went to the hospital the next morning and found that the patient had left, having coughed out a triangular shaped piece of bone the base of which would perhaps measure an inch and a half. He cited this case simply to accentuate the fact that we cannot depend upon any symptom as pathognomonic of a foreign body in the upper part of the esophagus, nor can we depend always upon the X-ray. He believed that when a patient had swallowed a foreign body the best plan was to search for it, but he had seen a great many cases where nothing had been done and the symptoms had all disappeared within the course of a few days. He thought the safest course was to search for them rather than to allow them to go on until inflammation occurred and caused increased difficulty in removing the foreign body.

DR. FRIEDBERG, closing, emphasized the necessity of always making a careful examination, stating that it is extremely difficult to determine whether anything is present or not. In

the soft tissues swelling occurs rapidly and hides the foreign body, so it is likely to be overlooked. As to the time that should be spent in looking for a foreign body, he considered anything over half an hour in a child or young person harmful, believing that it was better to make a short examination and repeat it later if necessary, as they could not stand the shock well.

Suspension Laryngoscopy.*

H. L. POLLOCK, M. D.

DISCUSSION.

DR. ROBERT CLYDE LYNCH, New Orleans, said regarding suspension under local anesthesia that he had maintained that suspension was preferable under general anesthesia until Dr. Israel had suggested powdered cocain, which was now used in the great majority of adult cases. He thought this had added greatly to the comfort of the patient under local anesthesia, and there was so far no systemic effect of the cocain used in that manner. In his practice he had practically done away with the necessity for an elaborate table; any ordinary table top which is strong enough to hold the crane would suffice. He no longer drops the head over the edge of the table as he first described; this has two advantages—first, that it is very much easier for assistants who are not accustomed to seeing suspension done or to help in a suspension, and very much easier for the physician or anyone to hold the head straight when it is resting on the table. Secondly, instead of putting the crane at the very end of the table it is put back as far as the horizontal portion of the crane will permit, with the handle of the crane simply swinging over the edge of the table; try to get the patient up in the Johnson position for a view of the larynx rather than in the extreme extension that the old position demanded. The old position demanded that the operator look up along the line of the spatula, and the new position permits looking down along the spatula. This has lessened the tension that occurs on the neck and hyoid bone. Under the old position this region becomes white and in the new this does not occur, and there is also less tension

*See page 793.

on the upper teeth. The only disadvantage he could find with the new position was that the lower teeth must be watched a little more carefully to see that the spatula did not press on them too hard. To guard against injury to the lower teeth he had recently been covering them with a modeling compound.

Referring to the work on the epiglottis, the speaker said that in cases where he suspected lesions of the epiglottis, such as papillomas in children where the face of the epiglottis has some of the growth, he places the spatula on the base of the tongue and then raises the jack, forces the tip of the spatula down the lingual face of the epiglottis and then extends the patient, in that way obtaining a very good view of the whole face of the epiglottis and bringing into view the portion wherein the epiglottis lies above the anterior commissure of the vocal cords. That presents a very much more normal position of the vocal cords; they are not stretched so much as when the spatula takes up the place under the epiglottis, and in cases under cocain it affords a better opportunity for operating. In cases where he deliberately goes in for epiglottis work he uses a shorter spatula than for larynx work and drives it down along the base of the tongue, thus obtaining a better view.

He had had thirty-three cases of simple papilloma in children; not the pedunculated growth seen in the young adult, but the multiple papillomatous growths that have always recurred after removal. In the thirty-three there were thirty cases that they had operated at one sitting and there had been no recurrence. They had used no medicine or application that would tend to inhibit a new growth, depending upon the operation alone to determine whether the dissection was complete or not. In the three cases in which recurrence had occurred, the first was in one where he operated away from New Orleans, and he thought the fact that he was not at home accounted for the recurrence. The second time he resected in his own home, and the growth had remained away for a year. One of the other cases had been operated on six times and the other four times. The one operated six times has finally come to a tracheotomy. In that case the growth apparently extended down beneath the mucous membrane, and the child now has a larynx that is as hard as wood, fibrous, and yet there are true

papillomatous growths down in the connective tissue. The microscopic sections could not be reported upon, as the last operation had taken place only three days previously. The other case was dissected perfectly clean macroscopically, so far as could be seen. The child did so beautifully under the anesthetic that they searched for papillomatous tissue but found no remnant at all. This child has regrown papillomatous material, not so rapidly as before, but if one was not careful the growth would come away with the forceps rather than give one an opportunity of dissecting the mass away from the base. The child was operated about six weeks previously, and there was no obstruction, although the voice had not returned to its normal. He considered the case in which the tissue was so thick and hard very interesting and thought it bore out the remarks of Green of Boston, who dilated on the fact that papilloma infected other tissues. In this case the child has grown papilloma of the glottis and of the uvula and at the junction of the supratonsillar fold which it never had before. The growths are small and pedunculated with a small pedicle and come away very easily. He believed the growths had taken hold along the line of the preceding operative procedures, and thought this bore out the fact that papilloma were in a manner contagious from one part of the tissue to another.

He had recently had a man who had laryngeal tuberculosis with quite a large ulcer involving half of the larynx and eating down into the arytenoid space so as to involve the cartilage, which would fold down and partially obstruct his breathing. After careful examination by an internist he declared that the process in the chest was thoroughly arrested. His epiglottis had been removed in Denver. They suspended the man under a general anesthetic and he had considerable difficulty with respiration; from the cyanosis that developed the flap became so edematous that it finally blocked his breath away entirely, so that they had to do a tracheotomy. They continued the anesthetic through the tracheotomy and then laid the ulcer open and found it was about three times the size they thought it was on the first examination. They cauterized this area with a most gratifying result, leaving the tracheotomy tube in place for a week until the area was healed, when they removed the

tube and reestablished his breathway. If he had a similar case he would not wait to have to do a rapid tracheotomy, and thought it was perfectly justifiable to do a tracheotomy, for the anesthetic would allow one to do all they wished at one sitting without subjecting a tubercular patient to a second anesthetic. This man was suspended twice, and on the first period of suspension he developed symptoms of asthma with a rise of temperature and had rather a stormy convalescence following the first anesthetic. He had a period of rest for six weeks and then a second anesthetic, and he had the stormy time under the anesthetic, and the tracheotomy was done, but they succeeded in doing all the second time that they wanted to do the first time. He thought the man was perfectly well now, and the tracheotomy had done nothing except permit doing all that was necessary at the second sitting.

Dr. Joseph C. Beck stated that when he first employed suspension laryngoscopy he had the head flat on the table. At that time he had never seen the procedure performed, had seen no pictures or anything else, and simply placed the patient flat on the table. With the patient's head flat on the table he attempted to see upwards, but could see nothing. Since he had recently seen Dr. Lynch in Memphis do a suspension operation with the head on the table he had tried it again, but could not see as well as with the head hanging over the table edge, so he continues to do the operation in the latter way.

He considered the contagion or spread of a papilloma very interesting and said that the little boy exhibited by Dr. Pollock had a perfect papilloma around the tracheotomy wound which was attached to the skin.

Dr. Pollock, closing, said in reference to having the head flat on the table, that they had tried this position in a good many instances, but still could not succeed in getting as good a view as with the head hanging over the table. They had had no bad results from this position, as a surgical nurse always held the head. The longest time spent in operating had been forty-five minutes under extension, and they had had no bad results from that.

Dr. Pollock thought that if Dr. Lynch obtained such good results with the supine position there must be something wrong with their technic, and they would try his method again.

In regard to treating papillomas, they had used no medicine or cautery or anything of the kind in these cases, but in the carcinomatous or tuberculous conditions they had cauterized the area. In a great many of the cases the question of doing a tracheotomy arises and in many instances they do this previously. With the exception of very small children they are done under local anesthesia, thus obviating two anesthetics, but in children the general anesthetic is necessary. Most cases referred to them come with the tracheotomy tube in position. In one case of a little child on whom he attempted suspension there was a small opening from a previous tracheotomy wound and the child was becoming asphyxiated, so they opened this old tracheotomy wound and gave the anesthetic in that way. In one case in which there was large tonsils they did the laryngeal work first and then the tonsillectomy with practically no anesthetic. The child talked and made an uneventful recovery.